# The Builder.

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## *The Modern Church.*

WE are approaching the close of a century which, as far as the architectural history of this country is concerned, will be remembered as that of the Gothic revival. The movement has extended over the greater part of the century, if we include the first symptoms of it in the publication of such books as Rickman's "Attempt to Discriminate the Styles of Architecture in England from the Conquest to the Reformation," which was first published in 1817 and had got to its fourth edition in 1835, though it was not till after the latter date that the movement began to take practical shape on an extended scale. It may now be said to be dying out with the century, and in regard to secular architecture it is, in fact, already dead. But it still retains in the main, its hold on church architecture. Certain modifications are practised occasionally; the plan with only narrow aisles for passage, with all the seating comprised in a wide nave, puts in a claim to be a utilitarian improvement adapted to modern requirements; and in some few recent churches we see a tendency to revert to Byzantine ideals, as a change from the repetition of the northern mediæval plan. But though the Classic school has resumed its sway for public and domestic architecture, it is rarely indeed that we see a Classic church built except among the Roman Catholics, who during the whole of the Gothic revival have architecturally symbolised their historical connection with Rome by the frequent erection of churches on Italian models, as if to them the Gothic revival were an accident of no moment. And in the Anglican church even the deviations from the mediæval model, to which we have referred, are comparatively rare so far; the majority of our churches are still mere reproductions of the mediæval church.

When the Gothic revival was at its height, the leading and most devoted practitioners, such as Scott, were emphatic in preaching that Gothic was not a "church style"; it was the "English style," the true old English architecture revived, and applicable equally to every class of building, sacred or secular: a position which was in itself perfectly right from a revival point of view. But the fact remains that the Gothic revival commenced in church-building, and that in church-building alone it at present survives, though Classic, or something allied to it, has taken possession again of secular architecture. A fact which shows that the use of the Gothic type for churches is due to something else than architectural preferences—and it is this something else which complicates the question.

Association of ideas is at the root of it; but it is association in two different senses. In the simple sense of mere habit of mind, a special type of building in which people have been accustomed all their lives to worship acquires a kind of sanctity of association; a building in any other style is, to them, "not like a church." But those who are influenced by this feeling are apt to forget that this is an association dating only from the commencement of their own lives. Pious persons who worshipped in the Georgian churches probably felt a similar association with them. Even if we take a wider view, and say that the great mediæval cathedrals have stamped that style for us as the church style, they only fill a small portion, after all, of the historic period of the Christian church. We heard the reply from a Roman Catholic once, in answer to a remark that St. Paul's did not give the impression of a sacred building—"O, but we do not feel that at all; to us the Italian style is more the church style than any other."

The more complex form of association in regard to church architecture is that which arises from a persuasion that a certain period of the church was the great one *par excellence*, that its dogmas and its ritual are for all time, and that the form of building which was evolved as the expression of that ritual is therefore as truly and specially the proper architecture of the church as it was then. Thus, those who regret the Reformation and regard the mediæval church as their ideal will naturally regard the mediæval building as being still its proper architectural expression. This is a form of association which we only refer to in order to show that we have not left it out of mind. Its discussion here would involve entering into questions of theology, or at all events of ecclesiastical polity, which would be out of place in these pages. We must therefore assume, as the basis of the argument, that the reformed Anglican ritual, in its form and its intent, is the accepted one in this country.

Starting from this point, it can hardly be questioned that during the whole of the Gothic revival we have been building, and that we are still for the most part building, churches the plan of which is at variance with the actual requirements of the ritual. The extended chancel has really no logical place in the plan of the Anglican parish church. How it came there it is easy enough to understand. It is a derivation from the mediæval cathedral plan; a misapplication of it under circumstances to which it is not suitable. The cathedral was divided into nave and choir for intelligible reasons. The whole religious service was performed by the clerical order alone; they were at once priests and choristers, and the choir was their enclosed and holy place for the exercise of their functions, to which the laity were not admitted. The choir was in fact the church, and was always the portion first built, when (as usual) the whole work could not be entered on at once; the nave was as much for architectural effect as for any purpose of worship—a vast ante-room to the church proper. It might or might not, on occasions, be occupied by a lay "assistance," but that in no way affected the performance of the religious service, which was carried on independently. Now we are building churches in which the architectural form and proportions of the cathedral choir reappear, in a more or less modified form, in the long chancel; and we even repeat the cathedral device of screening it off from the

nave as a kind of holy place, when there is no privileged clerical order to occupy it. But to keep up the association we place the choristers there, in the position formerly occupied by the members of the monastic order; and to assist the illusion we vest them in clerical-looking robes, although they are laity and the distinction between them and the worshippers in the nave is solely a musical, not a religious or ecclesiological one; they are merely worshippers who are specially competent to lead the singing, or to perform sacred music as an assistance to devotion. If there were no practical inconvenience connected with the arrangement, it might be accepted as a piece of picturesque effect with an interest of association connected with it. But in fact it has the double disadvantage that the singers are thus put in the position least adapted for them to be heard by the congregation (whether leading congregational singing or singing an anthem separately);* and as the practice of the ritual requires that some portions of the service be read at or from the communion-table, there is the further disadvantage that the officiating clergyman has to stand so far from the congregation, at the end of a comparatively narrow compartment of the building, that in parish churches of the largest size it is only with a considerable effort that he can make his voice heard.

These are surely practical objections worth taking into consideration. But the wider and more philosophic objection is that the architectural conception of the church plan does not in this respect properly symbolise the object of the building. We are not going to suggest for a moment that church planning should be regarded from a merely practical and utilitarian point of view; that would be as great a mistake in the other direction. If one regarded the church as an auditorium, the natural treatment for it would be much the same as that for a concert-hall or lecture-room; a theatre shape with rising seats. Every one who regards the church service as an aid to spiritual abstraction would instinctively feel that such a treatment was out of place; but why is it so? Partly, no doubt, because associations of a very different nature are connected with that kind of building; but also because it would be emphasising the utilitarian element at the expense of every other. If the plan of a church should not be manifestly at variance with convenience of hearing, as the mediæval plan is, on the other hand it must be remembered that the highest aim of church architecture, especially in regard to the interior, is that it should have an effect of grandeur, of solemnity, of aspiration, which should assist in raising us above our ordinary frame of mind, in taking us out of ourselves, as it were. It is not merely required that we should be able to hear conveniently the prayers, the singing (so much of it as is confined to the choir), the preaching, but that the building in which we are assembled should itself be an influence in harmony with these. In fact, we are to look and hear not merely into the church, but out of and beyond it; the building itself should be an architectural symbolism of the effort of the soul to rise above materialism.

On such considerations we may say that, although in a secular meeting-room or a concert hall, where convenience of seeing and hearing is the first consideration, the three-aisled plan divided by arcades or colonnades would necessarily be condemned, it does not follow that it should be condemned for a church. It is a finer and more effective manner of treating a longitudinal interior than covering it all under one spread of roof, and in the case of a church it is allowable that we should strike a balance between solemnity of architectural effect and pure utilitarianism. Moreover, if the influence of historic association is to be taken into account, the three-aisled nave has an association, of course, far more venerable than that of the mediæval cathedral. It takes us back to the early ages of the Church, before the line of demarcation between clerics and laity, symbolised by the cathedral with its choir and nave and dividing transept, was developed. The basilica plan, with its simple apse at the end for the communion-table and officiating clergy, and the space in front of it provided by a wider eastern bay, would still be one of the most suitable plans for a Christian church, but for the question of the music. That is the modern element in the matter. Music is the great modern art, and church music, though it has not developed as secular music has, is nevertheless a power in the church service which it was not in the early days of the Church. We demand now, where the resources of the parish are sufficient, a large organ and a large choir, and we aim at the production of music of an elaborate kind—too elaborate to be all joined in by the mass of the worshippers, to whom instead it is to be as a spiritual sermon, a *sursum corda*. On the other hand we must have some music of the broader and simpler class, such as metrical psalmody provides, in which all can join. And it is in regard to the provision for this that both the basilica plan and the mediæval plan fail, and need modification for modern use.

The mediæval plan is a failure in this respect whether for choir singing or congregational singing. The choristers, placed at a distance in a narrow chancel, are really no lead to the congregational singing, for their voices are lost. For choir singing only, much of their effect, as already noticed, is lost; and moreover, the organ which accompanies and sustains them (and which in modern church music often has an independent part of its own in the composition), must necessarily be near them, and the mediæval plan makes no provision for this. Hence the burying of the organ in the "organ-chamber," the only means of providing for it in this case, and where its sounds are half lost and its finest effect nearly nullified—except for the unfortunate choir; for if in this situation it is played loud enough to lead the congregation, it is painfully loud for the choir who are close under it.

We have therefore to find some arrangement by which organ and choir can be placed so that the choir should both be heard by the congregation when singing alone, and should really be an assistance to them in congregational singing. The whole subject, as some of our readers may remember, was considered a good many years ago by a joint committee of architects and organists, under the initiation of the Institute of Architects. The conclusion they came to was that the choir were best placed at each side of the nave and about the centre of it. The reasons for this are easily stated and understood. The long chancel, with the choir in it and the organ at one side, has absolutely no recommendation except that of association, and we shall consider it as dismissed. Then there is the question of the west end. Now a west end gallery is the finest position possible for the organ, on purely musical grounds. But the same position for the choir is open to several objections. The congregation could hear them well enough there, but there is a tendency always to turn towards the source of sound in listening to music; a chorus singing behind your back seems out of place. Moreover, it is desirable that the choir should be so placed as to convey the idea that they are a portion of the congregation worshipping and praising with them, not a separate body singing to them. Thirdly, the whole of the best of our English church music is based on the beautiful ideal of antiphonal singing, the answer from side to side; and this is lost with a choir placed centrally in an end gallery.

If we wish then to retain the three-aisled plan and provide this proposed position of the choir at each side of the nave, the arrangement sketched in fig. 1 might be suggested. This and the other sketch plans

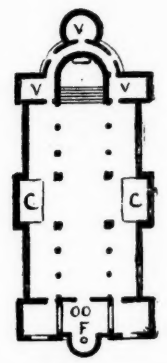



*Fig.* 1.

introduced are of course to be regarded simply as skeleton diagrams for explanation and suggestion*; the working out of the idea in detail could only be done on a larger scale; and such details as windows, buttresses, &c. are purposely omitted. In this and the other diagrams—

| | | | |
|---|---|---|---|
| C | stands for | ... ... ... | "Choir." |
| O | „ | ... ... ... | "Organ." |
| O O | „ | ... ... ... | "Organ over." |
| F | „ | ... ... ... | "Font." |
| V | „ | ... ... ... | "Vestry." |

If we wish, with this arrangement, to retain the three-aisled church, the choir may be placed at each side in the centre bay, which is treated with a wider and loftier arch with the double purpose of architecturally expressing its position and of giving a larger space to the opening in the arcade; the feature might be expressed externally as a transept of slight projection. In this case the organ is supposed to be placed in a west gallery over the entrance porch; here it would not be too far from the choir to accompany them, while it would be in the best possible position for effect when used independently. It would be possible, of course, to put the organ in two sections over or

* Congregations in general do not realise how much of the effect of the choir they lose from the sideways position of the singers in a long narrow chancel. But let any one stand in the chancel when a large choir are practising a choral anthem at rehearsal, and then go down into the body of the church, and he will be astonished at the difference in the effect.

* They may be taken as representing a scale of about 100 ft. to an inch.

at the back of each of the choirs; in these days of electric action an antiphonal organ presents no mechanical difficulty. But an antiphonal organ is only really satisfactory when there are such ample funds as to provide a complete instrument on each side; then, nothing could be finer; but otherwise, it is impossible to divide the instrument equally, in regard to power and quality of tone; the Great Organ pipes, say, must be on one side, and the Choir Organ and Swell Organ on the other. That means that one must have a weak organ on one side and a strong one on the other; and though the disadvantage might not be felt where the two halves of the organ are as near together as they are, for instance, at St. Paul's, it would be decidedly felt if they were separated by the whole width of the nave.

If it be said that thus to emphasise the central bay of the nave is to make an architectural anticlimax, it may be replied that although this is contrary to received precedent and association, after all the expression of praise in singing is one of the highest functions of Divine worship, and that therefore there is nothing æsthetically or religiously unsuitable in such a treatment. Another method may however be suggested which has the advantage of producing an architectural climax towards the east end of the building. This is indicated in Fig. 2. Here the wider bay is the last but one of the nave instead of the central one, and the two

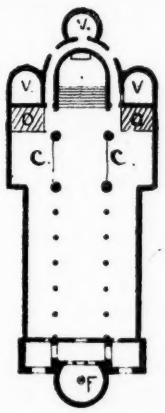



*Fig.* 2.

last bays expand into a transept, the wide bay coinciding with the choir and the last bay, of normal width, with the organ, which is placed at each side of the chancel arch, facing down the nave. Although the choir are placed sideways to the congregation, as they are in the usual chancel plan, they are nearer to the congregation than they are in the chancel, and they sing into the widest instead of into the narrowest space of the plan. As a mere matter of being heard by the congregation they would of course be better placed facing them; but this would be unsuitable both in an æsthetic and religious sense, for the choir are not supposed to sing *to* the congregation but to sing *with* them, as joining in and leading their worship: as soon as the choir are made to face the congregation there is a suggestion of a concert, of a musical performance, which ought always to be avoided.

So far we have been contemplating the retention of the three-aisled church of long form, as defensible on the ground of early Christian association, and because, though manifestly not the best form in a utilitarian sense for congregational worship, it has the merit also of fine architectural effect. A small church of the long form may be effectively designed in one span, because there we can retain a sufficient length in proportion to the width; but a parish church of the largest size can hardly be so treated effectively, because to obtain a length sufficient in proportion to the width we should have to make the interior too large for practical purposes. Westminster Hall, for instance, is a very fine example of a long interior under one span of roof, but to make it a practicable church for worship we should have to reduce its length by at least one-third, which would produce a bad proportion of length to width, and entirely spoil it. In other words, the three-aisled plan enables us to give an effect of vista without going to impracticable length. An interior may be either square or long in proportions, but it should be decisively one thing or the other. And this leads us to the suggestion whether, having got rid of that anomaly, the long chancel, the square form of church with a wide central space is not really the most suitable for modern worship, which is (in theory at least) as much congregational as clerical; whether this is not the form for the church of the future, as was in fact suggested by Wren in the "model" design for St. Paul's. As to the immediate point under discussion, the position of choir and organ, the square plan would be easy or difficult to deal with, according to its actual scale. In a small church, such as might be called a mere chapel, the position of the choir as indicated in fig. 3,

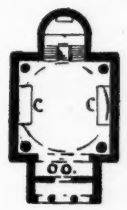



*Fig.* 3.

with the organ over the entrance porch, would be perfectly satisfactory*; but in a church on the largest parish church scale and of this shape it would not do, because the two choirs would be too far off to hear each other properly, and the organ too far from both of them. In such a church it would in fact be difficult to place the choir in direct relation to the architectural design of the building, except by reverting again to the chancel choir; we should probably be obliged in this case to merely treat the choir as a portion of the congregation divided off

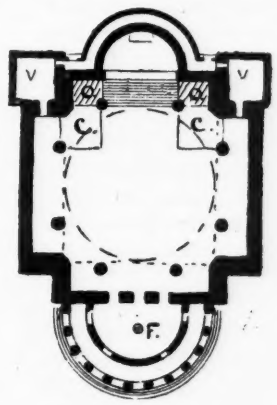



*Fig.* 4.

from the rest, as indicated in fig. 4, and seated sideways instead of fronting eastward.

* In this sketch the vestry is supposed to be beneath the chancel, communicating with the church by a stair, between the two flights of steps leading up to the chancel.

This is not quite satisfactory in an architectural sense, but it would be the only way, in such a plan, to bring the choir into sufficiently near relation to the congregation. The organ might be divided, as in fig. 2, on each side of the chancel arch.

In spite of this practical difficulty as to the placing of the antiphonal choir, and in spite of the long association attaching to the three-aisled plan, both in early Christian and in mediæval times, we are disposed to urge on clergy and church architects the serious consideration of the wide or square form of plan as really the one most suitable to modern congregational worship, both in regard to æsthetic expression and practical convenience. And we may further urge that it is also the form susceptible of the finest and most impressive architectural treatment. This point brings us to the question of the style of architectural treatment and detail to be preferred. We have already observed that it is a fallacy to regard Gothic as being essentially a church style. To do so is to substitute a partial and confined historic association for the wider one which takes in the whole history of the Christian Church. The question between Gothic type and Classic type (so long as we find it impossible to be uninfluenced by one or another of these) is to be settled on the same architectural considerations that we apply to modern architecture generally, sacred or secular. The long three-aisled form of church is in fact just as susceptible of Classic as of Gothic treatment. And the same may be said of the square form. There are not Gothic precedents for it, but it is simply a question whether the central roof is based on an octagonal or on a circular plan. St. Stephen's, Walbrook, has been often and justly admired as a congregational church plan combining architectural effect with convenience. Its defect is one which several of Wren's churches have, and which is probably due to restriction of site; viz.: that there is no chancel at all, only a railed-off space for the Communion Table, and thus the most important feature of the church worship remains without architectural expression in the plan. Otherwise it is so admirable a plan that one is surprised that while so much praised it has been so little imitated, especially since, with an octagonal lantern over the octagonal pier plan, it would lend itself just as well to Gothic as to Classic treatment. But if we are to aim at the noblest and most impressive interior effect in the square plan of church, we should unhesitatingly declare for the dome. No interior architectural effect is so fine, none so suitable for a church, owing both to its material beauty and its symbolic suggestiveness. There is a kind of cosmical grandeur about it; it is a suggestion of celestial space, a symbol of eternity. It may be bad in an acoustic sense, but we do not go to church for acoustics, at all events as a primary object. We hope to see the dome more often adopted in the church of the future.

The adoption of the dome would mean, undoubtedly, the adoption of the Classic type in church architecture. But that does not mean necessarily the adoption of a school of detail and ornament such as is seen in St. Paul's, and still more in many of the Roman Catholic churches built under Jesuit influence—a school of ornament more

or less tawdry and superficial. The religious expression of a church interior does not depend so much on whether the decoration is of Classic or Gothic type, as on the solidity of the construction and the thought bestowed on symbolism in decorative detail. This may be realised just as well in a church of Classic type as in one of Gothic type. Many of Wren's interiors, in spite of their admirable and ingeniously varied plans, impress us with a feeling of secularity owing to the want of monumental character and material in the structure, and the prevalence of ornament of a superficial and unmeaning type—festoons, garlands, and the rest of it. But this kind of detail is no necessary concomitant of the Classic type of architecture, which is essentially as capable of severe and symbolic treatment of detail as any other style.

There is one point in regard to the internal plan of a church to which we should wish to draw special attention, viz.: the fine effect of a comparatively lofty flight of steps up to the chancel. In the sketch diagrams inserted in this article we have contemplated this treatment in all cases. It has occasionally but not often been employed in recent churches. It adds so much dignity, beauty, and symbolic effect to the eastern termination of a church that we are surprised that it is not more often employed.

Finally, in the modern church one of the things we have to get rid of, to sweep away relentlessly, is the so-called "ecclesiastical art." There is no ecclesiastical art, in any logical sense of the word. There is good art and bad art, serious art and trivial art. What we want in a church is the most serious art with the most serious meaning. To imagine that this quality can be imparted by the imitation of the style of design of a past period, supposed to be specially ecclesiastical, is absurd. There is in fact no art so essentially trivial as this kind of imitative archæological design.

If we could see the domed form of church adopted and carried out by the best architectural genius of to-day, decorated with the best and most serious works of the best painters and sculptors, we might arrive at a type of parish church surpassing in beauty and suggestiveness any that have hitherto been erected on our soil.

## NOTES.

The Tholos at Epidaurus.

THE object of the curious circular building in the precinct of Æsculapius, at Epidaurus, has long been a problem to archæologists. At a recent meeting of the Berlin Archæological Society (reported in the *Arch. Anzeiger*, 1899, II., p. 124) a suggestion was made which seems reasonable, *i.e.*, that the Tholos was a sort of Odeion, or place for musical performances. In inscriptions the building is officially described as a *θυμέλη*, and musicians were, it is known, called *θυμελικοί*, and their contests *ἀγῶνες θυμελικοί*, because when performing in the theatre they stood in the *θυμέλη*. If this explanation be the true one it fits in well with the date of the "tholos," which was erected about B.C. 395, soon after the establishment of the musical contests at Epidaurus. It may be objected that the building is a small one for the purpose, but it is known that preliminary rehearsals were given to small numbers.

Monument to Charles Garnier.

THE subscription opened for a monument in Paris to the late Charles Garnier, the architect of the Opera House, has in less than a year's time amounted to 53,000 francs. With this sum in hand the committee are able to adopt the design of M. Pascal for a monument in harmony with the style of the Opera House. It will consist of a small architectural erection in red granite varied by the introduction of a green granite in certain portions, and surmounted by a bust of Garnier by Carpeaux, between two allegorical figures. The figures, as well as the bust, will be in bronze, slightly heightened with gilding. On the plinth the plan of the Opera House will be engraved. The monument is to be placed in the centre of the space flanked by the double incline from the Rue Auber, and will be a few yards distant from the rotunda occupied by the Opera library.

Railway Stations in Northern Prussia

WE have had occasion to refer from time to time to some of the great railway stations that have been erected in Germany, and to the general tendency to give the station buildings and all the structural works connected with a railway, a certain artistic merit and an individuality in design. We have just had an opportunity of travelling across Northern Prussia from west to east, a distance of twenty-four hours by express, passing, besides many small stations, cities like Aix-la-Chapelle, Cologne, Dortmund, Hanover, Kœnigsberg, and the various stations of Berlin. Everywhere throughout this journey the same remarkable neatness in the buildings was observable, and most of the stations seem to have been newly erected during the last ten years. Almost everywhere a dark yellow brick was used, generally with stone facings and excellent wrought ironwork. The waiting-rooms, booking offices, baggage-rooms, &c., are spacious and well ventilated. At the larger stations, such as Cologne or Hanover, considerable artistic merit is displayed in the furnishing and equipment of the first-class waiting and refreshment-rooms. In fact, the neatness of everything was obvious as applied, not only to the veriest detail of the station buildings, but also to the large bridges, signal boxes, viaducts, &c. This generally satisfactory result shows what can be done when the head officials of the railways take some interest in architecture and in the general appearance of the works under their control.

Supply of Sea-water to London.

WE learn that a company is about to be formed for the purpose of bringing sea-water to London, from an intake at Lancing, in Sussex, whence the water is to be pumped to a level of nearly 500 ft. at the top of Steyning Hill. It will then flow by gravitation through a main aqueduct to Battersea, and thence across the Thames to Cromwell-road, South Kensington, whence branches are to be laid for service in Paddington and Kensington, Mayfair, Marylebone, and the Strand districts, and in Whitehall and Westminster from a conduit at Charing Cross. It is also proposed to lay another branch main from Farringdon-street to Shoreditch, and along the Bethnal Green-road to Victoria Park. We hope that the main object of this is to provide for sea-water swimming-baths in London, which would be an immense boon. A company was formed a good many years ago to start a very large sea-water swimming-bath in the neighbourhood of Westminster, but the project was abandoned, we believe through difficulty in raising the required capital. We should think that a company for providing sea-water in London for this purpose ought to succeed, if the operations are on a large scale and the supply of water ample.

Bacteria and the Decomposition of Cement.

A CURIOUS anomaly in regard to the action of the bacterium known as the nitrifying organism is pointed out by the *Lancet*, in connexion with the disintegration of the cement lining of water reservoirs. This organism is usually present in abundance in the water, and is believed to be useful seeing that, in regard to the purification of sewage and effete matters, it has such an important beneficial function. The organism, however, cannot flourish in the absence of nitrifiable pabulum; but, in presence of the latter, nitrous acid is produced, which leads most probably to the disintegration of the cement lining of the water reservoir. We may remark the gradual change which is creeping over scientific thought in regard to this and kindred subjects. Not so long ago most of the damage done to cements and building stones of a calcareous character was attributed almost solely to the solvent action of carbonic acid. But Julien, some time since, showed that the disintegration of certain stones was brought about not so much by carbonic as by crenic and apocrenic acid. Recent researches, especially by Russian investigators, point to the circumstance that certain chemical changes are brought about through the medium of bacteria, and, in the absence of the latter, those changes do not take place. We are far from warranted, in the present state of knowledge, in saying that all chemical change is wrought or promoted by organisms, but it is impossible not to recognise the general trend of thought in that direction. If, as is now suggested, the gradual disintegration of cement in reservoirs is due to organic agencies, then cement makers will have to devise a cement with special reference to the action of the nitrifying organism; the resulting mud of decomposition teems with these bacteria. As the presence of the latter is distinctly beneficial to the water, the remedy certainly lies in employing a cement which shall be capable of withstanding their onslaughts, rather than by removing these bacteria from the water as far as possible.

Sanitary Condition of Ormskirk.

A LONG Report to the Local Government Board, by Dr. S. Monckton Copeman, on the sanitary circumstances and administration of the Urban District of Ormskirk, reveals a very bad state of things in a town which seems to have a long record of insanitary condition, judging from a report by Sir Robert Rawlinson just fifty years ago, which is quoted by Dr. Copeman. The present report gives in the first instance descriptions of the bad condition of various courts of small houses in the town. The water-supply appears to be good, and there is a complete sewerage system and a separate system of storm-water sewers; but the ventilation of the sewers is much neglected, a great number of street openings having been closed up owing to complaints of smell, and at present there are only four ventilating shafts at the highest points of certain

main sewers, these shafts having an internal diameter of only 8 in.; the Council have, however, recently ordered the erection of six more shafts of larger diameter. But the important charge in the report is as to the condition of the courts and alleys of Ormskirk, in regard to which the Sanitary Authority has been frequently urged to take action, but "little has been done within the last nine years, recommendations and advice from the Board and representations and complaints from other sources having been, in large measure at least, ignored." This portion of the question is thus summed up in Dr. Copeman's Report :—

"Doubtless considerable improvement in the slum areas of Ormskirk might be achieved :—1. By the abolition of boulder paving in the courts and yards in favour of some substance presenting a fairly smooth and impermeable surface. 2. By the removal of all privy middens, which, in their present form, cannot fail to constitute a grave nuisance. 3. By the opening through of back-to-back houses, so as to ensure efficient ventilation. 4. By insistence on the necessity for such an amount of open space around dwellings as would permit free access of air and light. This would involve demolition of a certain proportion of the cottage property.

Nevertheless, it is improbable that the question can be satisfactorily dealt with in any other fashion than by means of comprehensive schemes under the provisions of Parts I. and II. of the Housing of the Working Classes Act, 1890."

Railway Landslip in the Midlands.

ONE of the effects of the recent drought is the development of landslips in places which were thought to be perfectly stable, and the most serious of these has just taken place in a deep railway cutting, known as the Leire, on the Leicester and Rugby Midland Railway branch line. In this cutting the rail level is more than 70 ft. below the boundary fence, but the banks have given no trouble, hitherto, since the construction of the line nearly sixty years since. In the catastrophe the south bank developed into an enormous slide, more than 330 ft. in length and 70 ft. in depth. The section shows clay resting on a bed of sand; it is believed that the dry weather cracked the clay, and permitting the subsequent heavy rainfall to partially find its way into the sand, the latter became unstable, with the result mentioned. It was estimated that at least 40,000 tons of clay would have to be removed before the damage could be made good. It is, no doubt, very difficult to prevent accidents of this kind, for drainage works will not always avert them. The geological conditions appear to be a curious factor in the present case. Generally speaking, landslips result from the percolation of water through a porous bed until it reaches an impervious one, where, a line of weakness being created, and the beds being slightly tilted forwards, the porous bed slides over the non-porous. Or, the clay, loam, or similar deposit, becoming waterlogged through heavy rains, the beds are converted into a species of stiff slurry, and run. In the case of the Leire cutting, however, it would appear that the weight of the great mass of clay above the sand first caused a bulging and then lifted the rails. It is satisfactory to note that, in spite of the difficulties, a single line was enabled to be kept open. The work of clearing is being rapidly proceeded with.

Safeguards on Bridges.

A MOST regrettable railway accident which happened a few weeks ago in America has now been fully inquired into. It will be remembered that twenty-nine lives were lost and sixteen passengers were injured by the derailment and fall of an electric car from a bridge at Stratford, Connecticut. Facts brought out at the inquest, and as the result of independent investigation by the *Scientific American*, leave little doubt either as to the cause of the disaster, or with regard to its preventible nature. The road was entirely new, and the approach to the bridge was in a very unfinished state, so that when the loaded car was in the act of traversing the imperfectly-constructed track at the rate of some thirty miles an hour, it would be only natural for oscillation to ensue. This motion, once established, would be aggravated as the forward axle passed from the elastic road-bed to the unyielding abutment of the bridge. Under such circumstances, very little lateral pressure would make either the right or left-hand front wheel mount the guard rail. There is evidence to show that this is what actually happened. Examination of the bridge indicated that the right-hand wheel climbed the rail 10 ft. beyond the abutment, the flange then ran for 30 ft. upon the rail, next for 28 ft. inside the guard rail, and afterwards pursued a diagonal course along the ties for other 30 ft. before the car finally fell from the bridge. Apart from the defective character of the track, there is no doubt as to the inadequacy of the guard rails. They were of oak, measuring 6 in. high by 10 in. wide, but after allowing for notching over the ties, for the thickness of planking and for the height of the wheel flanges, the effective height was not more than 3 in. Bearing in mind the above mentioned deductions, the rails ought to have been at least 8 in. thick to begin with, and an inner pair of steel rails should have been fixed as an additional safeguard. Excessive speed is, of course, conducive to accidents of this kind, and, possibly, the powerful brakes now largely used may often constitute a temptation to permit higher rates of speed than are altogether wise at certain parts of a line. In view of the extension of the light railway system in the United Kingdom, it is undesirable that risks of the kind to which we have directed attention should not be overlooked.

The Photographic Salon.

THE Photographic Salon, which specially hoists the standard of the artistic treatment of photography, has opened its exhibition at the Dudley Gallery this week. There are a good many works which display what may be termed effects of art, but as far as we can judge these seem to be the result not of photography simply, but of working up a pictorial effect on the basis of the photograph. How much photography, in the ordinary sense of the term, is there really left in Dr. Henneberg's "Through the Fields" (54) and Mr. Kühn's "Sommermittag"(74)? Their appearance is that of heavily-scoured water-colour drawings in a rather dirty-tinted monochrome; the result is certainly not worth much trouble, if much has been expended to obtain it. Viscount Maitland's "Sunset, Kirriemuir" (163) appears to be a hand-coloured photograph; or has he really achieved photographing a sunset sky in something of its natural colour? Mr. Bremard, in "Moutons au Pâturage" (213) aims at raising photography to an art by printing it in an unpleasant greenish tint, and the use of a French title. What can really be done in giving an artistic element to photographs seems to lie in choice of subject and light so as to secure a good effect of composition, and (in landscape subjects) in reducing the hardness characteristic of photography, securing a soft texture and getting the values of foreground and distance correct. This has been well done, for instance, in Miss Devens's "The Pier" (21) which looks like a genuine photograph, and has the softness of a grey monochrome wash. There are other works in the collection in which a similar kind of success has been obtained. Mr. Ralph W. Robinson's three photographs of a girl's head, in a delicately carved wood frame, has the success which comes from the effective lighting and posing of a good subject. Baron von Meyer's "Portrait in the Style of the Old Masters" (141) is a very effective work, on a large scale, but a great deal of the effect is owing to the successful dressing up of the figure; the rest is the photographer's work, in avoiding hardness and securing a good lighting. Mr. Craig Annan shows a fine and solid-looking portrait of Mr. Orchardson. Attempts at illustrating ideal figures by photographs from life are, as usual, unsuccessful—proving how much in such cases we owe to the painters.

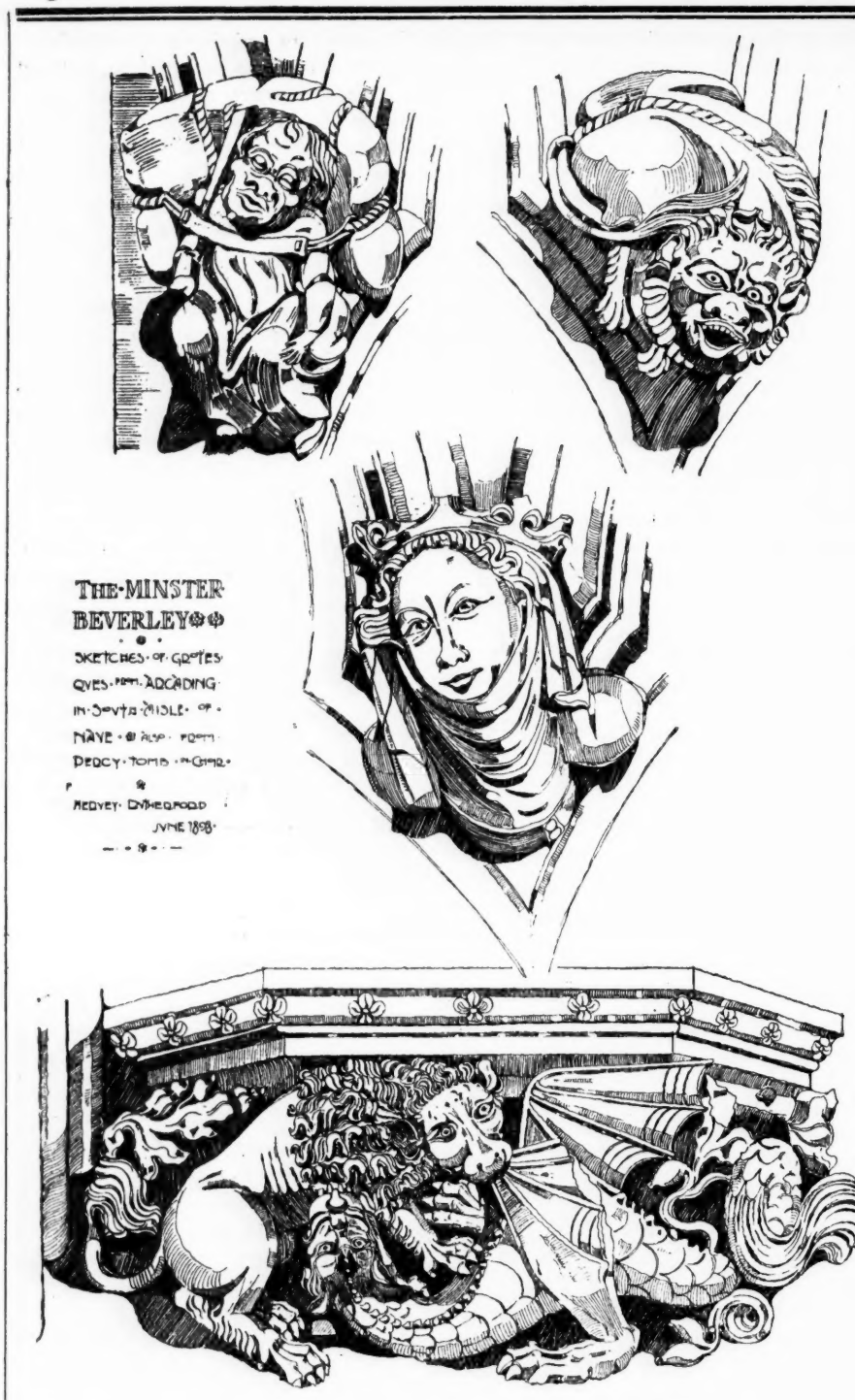
The Royal Photographic Society.

THIS society has its show at the rooms of the Society of Water-Colours; and though it makes no special profession of treating photography as a high art, there is perhaps as much interest in it as in the last-named exhibition, and not so many mere curiosities of effect. There are some admirable photographs; the carbon portrait, "Head of an Old Man" (21), by Mr. Dudley Hoyt, is a splendid one, and well merits its medal. A bromide by Mr. C. F. Inston, "After Rain" (191), is an admirable sea-piece with soft and atmospheric effect; this also has gained for its author a medal. Mr. Hensler's "When the Tide is Out" (267) and Mr. Kearney's "By Deva's Banks" (268) are both good in texture and atmospheric effect; and Mr. Corney Wilson's "Stranded" (274) is quite a little picture, the result of a happily-chosen moment and position. We remarked some time ago, in noticing a former exhibition, on the unaccountable neglect of architectural subjects, which are so peculiarly suited to photography; we are glad to see a change in this respect: there are a good many architectural subjects, some of them admirably executed; we may mention especially the Rev. Moncrieff Smith's "Tomb in the Church of Brou" (107) and Mr. Bushby's "Entrance to Old Mosque, Alhambra" (140); also the "Hall of the Abencerrages" (102), by the same hand.

The T-Square Club.

THE T-Square Club, of Philadelphia, has instituted a Travelling Scholarship ("Travelling" it is termed in their syllabus, but we decline to accept American spelling), to be awarded to the member who has done best in the competitions issued by the club. To quote from their prospectus :—

"In order to cultivate more logical thought, it has been decided to give continuity to the monthly problems by relating the programmes to one another, and they have been prepared with this idea in view, as well as to make the series terminate with a general review. The syllabus is presented in such a manner as to form a sort of pocket memorandum book, in which each competitor may jot down notes and criticisms under each programme




as they occur to him or as they may be suggested by other designs at the meeting.

All drawings must be signed, and the last one must be re-entered at the following meeting, corrected or not corrected, as the competitor sees fit. Thus, after a member has competed once, at the succeeding meeting he will enter an old and a new drawing, and in the last competition he will enter his entire set. Awards will be decided by a vote of the active members present, and each problem will be considered in the same class in making up an average of the mentions for the year."

Then follow the various subjects set with spaces for memoranda by the competitor. The subjects are of a kind bearing on practical architecture of the day. Altogether the scheme seems to be an excellent one.

ANCIENT WALL PAINTINGS, ASHMANSWORTH, HANTS.—The *Southampton Times* states that several series of wall paintings of great antiquarian interest have been discovered through the process of restoring the Early Norman church of Ashmansworth, a few miles south of Highclere Park, the seat of Lord Carnarvon. The most ancient series of paintings probably dates from about the year 1200, and represents the descent of our Lord into Hell. This painting is on the wall of the nave. Other scriptural subjects are also depicted.

## CARVING FROM BEVERLEY MINSTER.

THE decorative details shown in these illustrations are from the arcading in the south aisle of Beverley Minster, and from the Percy tomb in the choir.

They are from sketches by Mr. Hervey Rutherford.

## ASSOCIATION OF MUNICIPAL AND COUNTY ENGINEERS.

A MEETING of the South Wales district of the Association of Municipal and County Engineers was held at the Town Hall, Merthyr Tydvil, on Saturday, September 23. The primary object of the meeting was the reading and discussion of a paper by Mr. T. F. Harvey, Surveyor to the District, descriptive of the works which are in progress for the construction of the Upper Neuadd Reservoir, and a visit to the works. Mr. W. Harpur (C.E., Cardiff), President, occupied the chair; and among those present were Messrs. G. F. Deacon (London), T. H. Yabbicom (Bristol), A. H. Priestley (Cardiff), Williams (Mountain Ash), W. H. Hopkinson (Keighley), W. E. C. Thomas (Neath), Bell (Swansea), and others.

Mr. Owen, Chairman of the District Council, briefly welcomed the members of the Association on the occasion of their first visit to Merthyr, and expressed the hope that the meeting would prove interesting and instructive.

The President, in acknowledgment, said he was especially pleased that a meeting was held in Merthyr during his year of presidency, as he received his early professional training there.

Mr. W. E. Clason Thomas, A.M.Inst.C.E., Borough Surveyor of Neath, was unanimously re-elected Hon. Secretary for the South Wales district.

Mr. T. F. Harvey, Engineer to the Merthyr Urban District Council, then read a paper descriptive of the Merthyr Waterworks. He stated that the area of the district was 17,759 acres, and the population over 72,000. In 1858 the Local Board obtained their first Water Act, authorising them to impound the waters of the River Taff Fechan for the supply of their district, according to the plans of the late eminent engineer, Mr. Thos. Hawksley, who carried out the whole of the works, the capital expended amounting to 82,000*l.*; and from that time the district had had an abundant supply of the purest of water except in seasons of long drought. The site was no doubt selected on account of its cheapness, and although the embankment was only a shallow one, the top water area was 96 acres and the capacity 346 million gallons. Unfortunately the carboniferous limestone overlying the old red sandstone where the embankment was made is such that a serious leakage through the fissures of the rock had always existed, and had caused much expense and anxiety to the authority. The leakage, however, was measured over the gauge below the dam as compensation water to the riparian owners. It was seldom that a finer site for an impounding reservoir was seen, and it was unfortunate for the ratepayers that its natural advantages should have been only so partially utilised; for if the embankment had been made 500 yards further north, the foundation would have been on the old red sandstone; and if its height had been doubled the reservoir would have had a top water area of 190 acres, and a capacity of at least 1,500 million gallons, and, moreover, the cost of such an embankment would have been absurdly small for the volume of water which would have been impounded. Such a reservoir would have done away with the additional storage now being provided, and of the works now in progress.

In consequence of the expansion of the district and especially the deep sinkings to the steam coal in the southern portion of the district, it was deemed advisable to construct an additional storage reservoir, and in 1876 a provisional order was obtained and the Lower Neuadd Reservoir afterwards constructed. This reservoir obviated the necessity of pumping, the top water level being 1,412 O.D. The capacity when full was about 75 million gallons, and an independent line of 12-in. main took the water to separate filter beds at such a height as to flow therefrom by gravitation to the old service reservoir at the end of the pumping main for the supply of Dowlais and other high parts of the district. In 1895 the Act was obtained under which the Upper Neuadd Reservoir was now in course of construction by the engineer for the works, Mr. G. F. Deacon, and under the charge of the author, who was the Resident Engineer, the site of the dam being virtually selected by him in 1886. Owing to the conformation of the valley above the Lower Neuadd Reservoir no site existed for a short embankment to impound any large quantity of water, and therefore the masonry dam in course of construction was of considerable length; but although the site was a costly one for a low embankment, it was favourable to the construction of a comparatively large reservoir; and having in view the prospective demand for water to districts outside the limits of the Merthyr area, the Local Authority were justified, in his opinion, in deciding to construct a reservoir which would not only meet their own requirements, but would yield a large surplus of water to meet demands from outside sources and produce revenue to aid in the repayment of the capital borrowed under the Act. The rainfall on the catchment area was high and from 1888 to 1894 had varied from a minimum of 45·13 in. to a maximum of 76·47 in. The work was being partly done by contract and partly by administration, none of the contractors' men being engaged upon the dam itself. The principle involved in this dual execution of the works was that of endeavour-

ing to leave no loophole for defective building of the dam. The reservoir would contain about 350 million gallons, the surface area at top water level being 59 acres and drainage area 2,018 acres. The height from the bed of the river at the vertical face of the dam to top water level was 67 ft. 3 in., the level of overflow being 1,506·5 ft. O.D. The total length of the dam was 1,622 ft., of which 1,390 ft. would be visible above ground. The dam crossed the valley nearly east and west, the formation being old red sandstone. The height of the dam, from the foundation to the footwalk, was 84 ft. 6 in. The cross sections were of three different classes. The central, or overflow, 82 ft. wide, was so designed that the weight of the structure alone, whether the reservoir was full or empty, kept the centre of resistance well within the middle third of the base. This portion was curved in plan, not for additional strength, but rather to direct the main overflow towards the centre line. Immediately east and west of the two towers flanking the overflow the cross section was also such that, without extraneous aid, the centre of pressure always lies within the middle third of the base. Still further east and west, where a large portion of the dam was below ground, the excavated material was embanked against the concrete and masonry, and a portion of the supporting pressure due to the earthwork was credited to the dam, so that the base was narrower, though the dam was really stronger than it would be if standing alone and designed to a full gravity section. The overflow portion between the pilasters or ribbons was 89 ft. in length, which near the top was divided into six bays of 12 ft. each, in which would be filled greenheart stop planks to a depth below overflow level of 4 ft. On the east side of the overflow a tower would be carried up to a height of about 55 ft., which would contain the tank for flushing the intake and strainer, and the lower part of which would serve as the valve-chamber. Whatever the height of water in the reservoir, the water for the main (which would be 16 in. diameter) would be drawn from near the surface and would be strained through frames of copper-wire gauze without reducing the reservoir head upon the pipes to that of the outlet level. The foundation on both sides of the middle part of the dam was taken down through the drift, and through a considerable depth of marl and loose rock to sound rock, or near the end of the trenches to hard marl. The quantity of water met with in sinking the trenches was not at any time very great—which in this formation was as might be expected. The timbering of the trenches had been done by the ordinary method of polling boards in settings 3 ft. apart. A good deal of the ground consisted of loam and loose débris with some running sand above the marl; and hence it had been found quite impracticable to remove the polling boards for a considerable length of the trench, both on the east and west side. The concrete below the original surface of the ground was either Portland cement concrete, or Aberthaw pebble lime concrete, the former only being used for a limited thickness over the rock formation and up the water face. There could be no doubt that the Aberthaw lime properly treated made an excellent mortar for hydraulic work, and it would keep on improving in strength for a long period. Its slow setting rendered it unsuitable for placing where the action of running water went on, but otherwise it was a safe and reliable cement if properly treated, and the mortar made was tough and "gluey." The average tensile strength in six months of the mortar made with lime sieved through 2,500 meshes to the square inch was 340·7 lbs. per square inch, while the finer commination produced by the burr stones gave a strength of 380·5 lbs. The stone for the masonry, as well as for the concrete and rock sand, was obtained from a quarry of carboniferous limestone situate about seven miles from the works. The stone was very hard, and its weight per cubic foot was about 169 lbs. Blocks of great size were obtainable, and a large proportion of the stone used in the dam weighed from two to six tons. Both the water face and the outer face consisted of heavy rough broken work, the outer face of the overflow having a liberal projection of rock. All the face stone was roughly squared to a pitch line. The hearting consisted of large blocks of stone having a good flat bottom bed, placed near to each other, and well bedded on a thick layer of mortar, the stones being well sunk down into the mortar. The spaces between the blocks, although of an irregular shape in plan, were fitted to break joint and filled with concrete, and where large enough, rubble stone was packed in, punners and iron tools of various shapes being used to fill in all the spaces tightly, and to bring up the surface to form a proper bed for receiving the next layer of mortar. It might be mentioned that this was only the second dam constructed in this country in which the cementing material was mainly hydraulic lime mortar. The Kendal (Fisher Tarn) Reservoir was the first. The valves were closed in February last at the Kendal Reservoir, and the water was now within a few feet of the overflow. He understood from the engineer (Mr. Deacon) that the dam was quite watertight. The lime was obtained from the neighbourhood of Warwick, a different part of the great outcrop of lias lime running across the country from north-east to south-west, from that from which the Aberthaw pebbles were formed on the south coast of Glamorgan. It was manipulated at Kendal in the same manner as at Merthyr.

Mr. G. F. Deacon, London, moved a vote of thanks to Mr. Harvey, for his excellent paper.

Mr. A. H. Priestley, Cardiff, seconded the vote of thanks, and asked whether the water to the tank in the tower had to be pumped, or was conveyed by gravitation.

Mr. Williams, Mountain Ash, said he wished to ask why limestone had been brought, when there was an ample supply of sandstone in the district. Was it that limestone was more suitable for the work? The excellent results of the tests of Aberthaw pebble mortar were most interesting, and he was glad they had been put in the paper.

Mr. T. H. Yabbicom, Bristol, said he had recently had practical experience of a forty-years' test of mortar made from Aberthaw pebbles. His predecessor at Bristol used this limestone mortar for drainage work at Bristol forty years ago, the clean Aberthaw pebbles being ground with furnace ashes, and on recently cutting into the sewers, he found that the bricks had worn below the mortar with the scour. He considered a practical test of that kind was even more valuable than a test obtained from a laboratory experiment.

Mr. Orton, Cardiff, wished to know whether any difficulty had been obtained in taking the timber from the trench. In the neighbouring valley of the Taff Fawr they passed through a considerable quantity of running sand, and there they had great difficulty in taking out the timber. It occurred to them to build brick pillars under the timber to carry the weight of the timber above, and as they came up the timber was taken out without any trouble whatever.

Mr. Cox said he would like to ask whether the engineers were satisfied that Aberthaw lime was a safe material to use in the construction of reservoirs. He asked this question because Aberthaw lime had been used in a small waterworks in his district, and on taking out some recently, after ten years, it was as loose as the day it was put in. He would like to know whether Aberthaw lime did get loose when surrounded by water.

Mr. Wyrill, Swansea, also wished to know why the local stone was not used on the work. Probably there was good reason for the preference for limestone which did not appear on the face of the paper. With respect to the section of the dam (exhibited on the walls of the meeting-room), the profile appeared very light, and the only question of stability referred to in the paper was that the power of resistance came in the middle third of the dam.

The President said he was satisfied that a wise course had been followed in building the dam by administration and not by contract. The Cardiff Corporation found that the only course they could adopt in the building of the reservoir on the Taff Fawr; and it had been adopted in several other cases in which Mr. Deacon was engineer.

The vote of thanks having been carried with acclamation,

Mr. Harvey replied to the various questions asked in the course of the discussion. He stated that the water was conveyed to the tank in the tower by gravitation. The use of limestone cement was determined partly by experiment and partly by practical knowledge. The weight of the limestone was rather heavier, and the experiments proved that the mortar made from it stood a higher tensile strain. There was no doubt, if properly prepared, Aberthaw lime was a most excellent material. The Aberthaw lime spoken of by Mr. Cox, which was loose after ten years, must have been imperfectly prepared. If it had been properly prepared, such a thing could not have happened.

Mr. G. F. Deacon, London, engineer of the scheme, in supplementing Mr. Harvey's reply, said there could be no question whatever as to the crushing power of limestone. Thousands of briquettes had been made which had determined it. However well washed river sandstone was they could not get rid of the fact that each grain was decomposed by the action of lime on its surface, and would not adhere so well as the newly-crushed particles of clean rock. With respect to the use of hydraulic prepared lime concrete one property had not been mentioned—that the permanent elasticity of limestone concrete was greater than Portland cement concrete. A rod of Portland cement concrete submitted to all changes of temperature would crack more, though its strength would be greater, than a rod of hydraulic lime concrete. It was a material that would not crack that was wanted more in works of this kind than the element of strength. Every engineer knew the strength they had at hand was vastly greater than they wanted in structures of this kind. The overturning of a dam did not depend on tensile strength but on different matters altogether. The question of mixing limestone with furnace ashes had been mentioned. Good mortar could be made in that way, but it wanted density and weight. Here they wanted to get every pound of weight into the structure, its stability depended upon that more than anything else. It had been mentioned that the dam looked light, but the pressure fell very largely upon the middle third, and the dam was stronger than many other dams. The timbering was hard to take out where the ground was bad, but exceedingly easy wherever the ground would stand for a depth of 3 ft. On the question of lime manipulation, it had been said that the lime cement came to grief. They had heard that before, and also of Portland cement coming to grief. They had had slabs made which could be seen at the works which would assure any one that limestone cement was quite as safe as the best Portland cement. He had taken a great deal of interest in the matter of rainfall, and was convinced that the way in which some engineers depended upon a single gauge was most hazardous. They had a battery of gauges placed within a distance of 200 ft., which showed a variation of nearly 50 per cent. Therefore they could well understand how fearfully erroneous might be the depending upon a single gauge anywhere, even though they had the best judgment as to the position of the gauge. When they could buy very good gauges at 15s. or 16s. each there was no reason why any Council should not put down ten or twelve gauges; then they would get at the actual facts.

The members then proceeded by special train to Torpandu and thence by the waterworks truck train to the Neuadd reservoir. Luncheon was served in the Mission hall on the works, Mr. Owen presiding. The toasts of the Queen, the Merthyr Urban District Council, the contractors (Messrs. Holme & King), the Association of Municipal and County Engineers, and of the Engineer of the Works (Mr. Deacon) were honoured. The afternoon was devoted to an inspection of the works described in the paper of Mr. Harvey.

## *ARCHITECTURAL SOCIETIES.*

GLASGOW ARCHITECTURAL ASSOCIATION.—At the opening meeting of the 22nd season of the Association, held in the rooms, 187, Pitt-street, on the 19th inst., the President, Mr. John Fairweather delivered his opening address on "The Association and its Work." Briefly reviewing the many changes which had taken place in the twenty-one years of its history, the President, while acknowledging the vast increase in the membership, had to complain of the proportionate decrease of interest taken by its members, draughtsmen, craftsmen, and juniors, particularly the latter, the very class for whose benefit the Association was originally instituted. He enumerated the various benefits to be derived from the Association, both architectural and social, and pointed out that if each would come forward, join hands with the committee, and do his utmost as an individual to further the aims of the Association, there was no limit to the influence which might effect as an educating body.

*Design for a Friezc. By Mr. E. M. Atkins.*

## DESIGN FOR A FRIEZE.

THIS design, by Mr. E. Merton Atkins, is a conventional treatment of the poppy, with figures, and is to be executed above a high oak wainscoat (panelled) in the hall of a country house.

The floral and foliated parts are to be stencilled, and finished off by hand work, the figures being each a separate design.

The carpets, hangings, &c., are to be of sage and olive greens, with steel blue and turquoise.

The design was exhibited at the Royal Academy this year.

## PUBLIC HEALTH CONGRESS.

THE Annual Congress of the Royal Institute of Public Health, held this year at Blackpool, which began on Thursday, September 21, gave promise from the first of being very successful, over one thousand members having been enrolled before the close of the opening day's proceedings. The Mayor of Blackpool, Sir Matthew Ridley (Home Secretary), the Member of Parliament for the division, and a large number of the leading residents joined in the welcome offered to the Marquis of Lorne, President of the Congress, and the other visitors, the reception and first sitting of the Congress being held at the Grand Theatre. Professor Wm. R. Smith, President of the Royal Institute, having invested Lord Lorne with the President's badge of office, the Mayor of Blackpool vacated the chair and the new President was installed, and delivered the inaugural address (see *Builder* of last week).

After the usual votes of thanks the sitting was adjourned, to be resumed in the afternoon at Raikes Hall, where a rather extensive collection of exhibits of sanitary appliances had been brought together to form the Health Exhibition. The exhibition was formally opened by the Marquis of Lorne.

The sectional sittings of the Congress began on Friday morning, Dr. Hope, Liverpool, presiding over Section A, Preventive Medicine; Dr. J. C. Thresh, Essex County Council, instead of Mr. A. E. Fletcher, who was unable to attend, over Section B; Mr. Benjamin Sykes, C.E., over Section C, Engineering and Building Construction; and Mr. T. Loftus, Town Clerk of Blackpool, over Section D, Municipal and Parliamentary.

In Section B the inaugural address of Mr. Fletcher, the President Elect, was read by Dr. Thresh, the leading points touched upon being the pollution of the atmosphere by noxious gases arising from alkali works, and smoke production, and the pollution of rivers by offensive discharges from works of that and other kinds. In concluding the paper the anthor declared his opinion that "the time had come when society is ripe for legislation respecting the pollution of our water and of our air. And it may be said that no great progress can be made without such legislation. Public opinion is necessary to bring on reform, but it must be crystalised in the form of an Act of Parliament before it is largely operative. Let us hope, therefore, that one result of this Congress may be to hasten the time when wise and efficient legislation will help to cleanse our streams and purify our air, so that the health of the people may be greatly improved and life in our crowded cities made more enjoyable."

Three papers on the subject of atmospheric pollution were then read—namely, "A Century of Smoke Production, with Efforts for its Abatement," by Dr. W. Graham. M.O.H., Middleton; on "The Pollution of the Atmosphere of Large Towns," by Mr. William Thomson, Royal Institution Laboratory, Manchester; and on "Coal Smoke and the Public Health," by Mr. E. A. Brayley Hodgetts.

In Dr. Graham's paper the history of smoke abatement legislation is traced from the London Smoke Act of 1853, and details the various attempts to attenuate the evil by mechanical appliances, and gives a summary of the evil effects of smoke and the resulting deprivation of sunlight on the public health. The methods of prevention are, perhaps, sufficient, but the law is lax, and a better administration of the Acts should be provided for. To bring this about, determined pressure on the part of the community is required; and the author expressed the hope that the present century would not end without reasonable protection being given against these evils.

Mr. Thomson said that when one stood upon a hill and saw hanging over a town a black canopy of smoke, it was obvious that the inhabitants of that town, and more especially those of the poorest class, must be breathing a contaminated atmosphere. The smoke produced by domestic fires was not touched by the Acts, and the author suggested that the Local Authority in all towns should erect a central shaft or series of shafts into which the smoke from the surrounding group of houses might drain. The smoke produced by dwelling houses might also be reduced by the more extensive introduction of stoves in place of open fireplaces and of gas in place of coal for heating and cooking purposes.

Mr. Hodgetts, in his paper, treated the question neither from the artistic, nor the sentimental, nor the economic standpoint, but exclusively from the hygienic point of view. If the study of this important question was earnestly taken up by the medical profession the battle would be more than half won.

The discussion on the three papers was opened by Dr. Hewitt (Cheshire County Council), who advocated the appointment of Government inspectors instead of sanitary officers, who sometimes found it difficult, if not impossible, to be impartial.

Dr. Sergeant (Lancashire County Council) would prefer to attack the Local Authorities, and not the sanitary officers.

Mr. Scott (Salford), Secretary of the Smoke Abatement League, pointed out that so long as dwelling-houses were exempt from remedial legislation they could only employ moral suasion to bring about the reform.

A resolution embodying the views expressed in favour of Government rather than Municipal control in carrying out the Acts was adopted by the section, and a recommendation to the Council of the Institute to adopt such practical means as were available for carrying out the views of the section was made. The section then adjourned till Saturday.

The section, after discussing a chemical question introduced by Sir Charles Cameron, resumed the reading of papers with one on "The Treatment of Sewage," prepared by Mr. W. J. Orsman, Public Analyst, Wigan, which was read by one of the secretaries of the section, in the author's absence. Leaving the Bazalgette system of discharging sewage into the sea or tideway and the Septic systems aside, the paper dealt chiefly with Precipitation and Irrigation systems of treatment. No hard and fast rules should be laid down, so far as chemical results were concerned, but the object in both systems was to get a good effluent which could be turned into a stream or river without causing a nuisance. A good effluent should be clear, should not putrify on standing, and should lend itself to rapid oxidation. In both, precipitation should precede filtration. Sewage farms had, as a general rule, not been successful commercially, the supposed manurial value of the sewage having proved to be mythical.

Dr. Hewitt, Chairman of the Health Committee, Cheshire County Council, the principal speaker in the discussion, said no doubt if they could get sufficient land at a sufficiently cheap price, there was no better way of treating sewage than to turn it on to the land to develop microbes. At Berlin and also at Paris this had been done with conspicuous success, and in this country where land was of a suitable porous quality, a certain measure of success might be attained, but here we had to deal with great differences of temperature between summer and winter. In this country, where land was enormously dear, it was a great advantage to have had brought up the bacteriological treatment of sewage. His own opinion was that the solution of the problem would be found in filtering beds, without the employment of precipitants of any kind. The bacterial system (with precipitants) in use during the last three years in Manchester had given very good results. They had passed 600,000 to 700,000 gallons per day, and they still remained as active as ever, for although they did not pass quite so large a volume they got a much purer effluent than at the beginning. Professor Clowes was going to try the effect of filters 13 ft. deep, instead of 4 ft. or 5 ft., and he expected to get a better effluent than with precipitation by lime. If deeper filter-beds would multiply the results already obtained, as Professor Clowes hoped, we must be nearer to the solution of the question than ever before.

Mr. Naylor (Chief Inspector of the Ribble Joint Committee) thought that something should be added to the author's definition of a good

effluent. It should not only be clear, and should not putrify on standing, but (he would add) it should not contain what might subsequently produce putrefaction.

Two papers were then read on the subject of ventilation, the first by Mr. E. L. Hartley, Barrister-at-Law, on "Humidity and Ventilation in Factories," and the second on the "Ventilation of Industrial Buildings" by Mr. Casmey (the Blackman Ventilating Company). In Mr. Hartley's paper it was shown that an agitation which sprung up twelve years ago in Blackburn against excessive humidity in cotton cloth weaving sheds had led to the regulation of the amount of humidity permissible, by an Act of Parliament (The Cotton Cloth Factories Act, 1889), and through the great tact of H.M. Inspector of Factories, Mr. Osborn, had led indirectly to a great improvement in the ventilation of weaving sheds. The regulation of humidity had proved so great a boon that a further agitation arose to make compulsory the regulations for ventilation, and the Cotton Cloth Factories Committee, with Sir Henry Roscoe at its head, was appointed in 1897 to inquire into the working of the 1889 Act. This Committee left the humidity regulations alone, but upon its recommendation a rule was promulgated from the Home Office in 1898, deciding that during working hours, in no part of a cotton cloth factory shall the proportion of carbonic acid ($CO_2$) or the carbonic oxide exceed nine volumes per 10,000 volumes of air. Under certain conditions of the atmosphere of a factory—as, for example, on foggy days, when the gas must be lighted earlier than usual—the author thinks it is impossible to secure this degree of purity, and he suggests an amendment of the rule. The rule would be more reasonable if it prescribed that the fixed standard of purity should be generally attained. The author said, in conclusion, "there is no doubt in my mind that the compulsory ventilation has been beneficial, and that the standard of ventilation can be with advantage considerably raised above the level of the Act of 1889, and that, judging from the death statistics of Dr. Wheatley, the Medical Officer of Health for Blackburn, the occupation of a weaver is the healthiest of all the occupations in that town."

In the discussion which ensued Dr. Wheatley said he agreed with the recommendation of Sir Henry Roscoe's Committee. Mr. Hartley had omitted to mention one most important point, namely, the necessity of a supply of clean steam. The practice in these weaving sheds was to get steam from any water that was readiest to hand, and sometimes it was taken from highly polluted water, and this practice was very deleterious to health.

Mr. Casmey, in his paper, divided industrial buildings into three classes—textile, non-textile, and engineering and other works—in the first of which about 1,250,000 persons were employed, in the second 2,750,000, leaving about 1,000,000 for the third category of workers. These five millions of workers were congregated into 162,000 hives of industry, many of which were carried on under such conditions that the air was practically charged with floating dust that found its way into the human system causing irritation to the air passages and often culminating in consumption. An interesting comparison was made in the paper between factories where compulsory ventilation was enforced by the Home Office rule, factories were it was not enforced (those not having a humid atmosphere), and non-industrial buildings, such as schools. In twelve mechanically ventilated weaving sheds, the average amount of carbon dioxide was 11·6 per 10,000 volumes of air, in twelve dry weaving sheds where natural (non-mechanical) ventilation was the rule it was 23·4, while in twelve schools in the same district it was 23·5. "We cannot," said the author, "condemn with language sufficiently strong the Authorities who allow such a state of things to exist in public schools." Dusty rooms, it was shown, and non-dusty departments of factories, should be ventilated on opposite principles. In the former, the exhaust principle should be employed to keep the dust particles down near to the floor, where they should be extracted. On the other hand, the non-dusty departments, especially the spinning and weaving departments of textile factories, should be ventilated on other lines. Fresh air should be blown into the room or works from different points, and exhausting fans also fixed so that a constant change of air is taking place in all parts of the area dealt with. To avoid any possible chance of draughts, the blowing in should be slightly in excess of the extracting, so that a plenum or pressure is maintained in the room. Wherever this system has been properly carried out the results have been all that could be desired.

Mr. Somerville (Somerset County Council), who opened the discussion, referred to a large school where the head mistress showed complete ignorance of the principles of ventilation. He thought public schools, as well as Board schools and voluntary schools, ought to be subject to inspection by Medical Officers of Health.

The business of the section being concluded, the usual complimentary votes were accorded.

*Engineering and Building Construction.*

This section, which was numerously attended on Friday at its first sitting, was presided over by Mr. B. Sykes, C.E., Preston, who had prepared as an opening address, a review in broad lines of the progress of engineering science in this country during the reign of Queen Victoria or since 1837. Up to that date only about 1,000 miles of railway had been constructed in the United Kingdom at a cost of 30,000,000*l.*, while at the present time we had more than 1,000,000,000*l.* of capital invested upon more than 22,600 miles of railway. "The world," said the President, has increased quickly during this century; it has flung the strength and resource of its most vigorous life into scientific experiments, engineering experiments, into earnest method and skilful industry, and into adventurous trade projects that have swiftly followed the explorer's tread.

The colossal undertakings of the past—at home, the Forth and Tay Bridges, the Severn and Mersey Tunnels, the Manchester Ship Canal, and on the Continent the Mont Cenis and the St. Gothard Tunnels uniting two countries, the Aalberg Tunnel uniting two Austrian Provinces, also the large bridge at Tchernavado uniting the Roumanian railways on either side of the Danube—are but the precursors of greater works to be undertaken in the future in the construction of which British engineers and British capital will be engaged. The most prominent of these is to place England in unbroken railway connexion with the Continent of Europe by a tunnel under the English Channel, starting from Dover and St. Margaret's Bay, and proceeding in a straight line to the French coast near Tangath, six miles south-west of Calais. Another great work which has received considerable attention, and which is likely to receive more, is one to unite the English and Scotch Railways with those of Ireland. The scheme has been revised by three eminent engineers, viz., Mr. James Barton, Mr. Hawkshaw, and Mr. Harrison Hayter.

In concluding his review, the President pointed out a less bright feature in our engineering development. He said Great Britain is facing keener competition in her engineering industries and commercial relations than ever before; a competition that is daily becoming more assertive, which threatens, if not tackled with the pertinacity, fixity of purpose, and thoroughness for which our countrymen have become world famous, to sap the very vitals of our national prosperity. Take, as an example, the Atbara Bridge contract, given to an American firm, which was delivered in six weeks. I doubt, he observed, whether any firm in the United Kingdom could have done it.

Two papers were next read on the "Disposal of Refuse," one by Mr. Geo. Darley, Superintendent of the Cleansing Department, Leeds, and the other by Mr. R. B. Hodgson, Birmingham, which were followed by discussions.

Mr. Darley's paper furnished details of the various improvements made from time to time in the refuse destructors in use at Leeds since 1877, when the first were erected, and the results of visits to others at Blackburn, Bolton, Warrington, and Manchester, upon which he had reported to his authority. Until 1886, when they adopted Jones's cremator, complaints had been more or less frequent regarding the stench and smoke produced. The next improvement introduced was the steam jet suggested by Mr. Horsfall, upon whose design they had increased their destructor capacity at Leeds from twenty cells to forty cells, the additions being of the Horsfall type. The steam jet enabled them to increase the temperature from 750 deg. F. to 1,379 deg. F. The last type of destructor reported on was the Mason Gasifier, working at Moss Side, Manchester, the results of a twenty-four hours test made in August last showing a high percentage of available heat for use to drive electric light or other motors.

The paper of Mr. Hodgson dealt with Refuse Destructors, with special reference to the use of the "Econometer," which was then described.

The main object of the "Econometer," or gas-measurer, is to serve as a guide to the regulation of the admission of air into furnaces. If more air is passed through a furnace than is required for complete combustion, the inevitable heating of the excess is clearly a source of waste. This instrument automatically and constantly indicates the percentage of $CO_2$ in the combustion gases. By maintaining an even, clean fire, free from holes, by the proper admission of secondary air over the fire, and by regulating the dampers or the air-presure in the ash-pit, in the case of a forced draught furnace from 10 to 15 per cent. of $CO_2$ should be registered.

A discussion took place, in which several questions were put to Mr. Darley respecting some of the destructors he had referred to.

The last paper taken at the sitting was on "The Purification of Sewage by Microbes," by Mr. C. F. Whitaker, F.C.S. The bacteriological methods of treating sewage were due to a suggestion of Pasteur that micro-organisms were the active principle at work in the soil. The retention of sewage in tanks for bacteriological development was the first essential preliminary in the biological treatment of sewage, the tank and filter-bed forming practically a system of land filtration, working under the most favourable circumstances. To produce the best results it was necessary to distribute the sewage equally all over the bed, and this was accomplished by Mr. Whitaker at the Coppy Clough Sewage Works, Church, Accrington, by means of revolving sprinklers. Details were given of these works, where for eighteen months sewage had been treated, with excellent results.

Mr. Dibdin (London) was invited to open the discussion. He said he looked upon Mr. Whitaker as one of his own followers. He had been his teacher, and now the pupil was trying to beat his tutor. It had been his privilege and his great pleasure to do what he could to revolutionise our systems of sewage treatment. The first criticism he would offer regarded the term filtration as applied to the work done in bacterial filters. It was a misnomer, because it was in reality a process of fermentation. It was a living process of digestion. After a question by Mr. Marston, the speaker said the purity of the effluent was the whole sum and substance of the argument. The effluents from a good bacterial process were good enough to be discharged into any stream. Even if discharged into a dry watercourse, fish would live in a good bacterial effluent.

Mr. Whitaker replied to numerous questions raised by various speakers in the discussion, and the section adjourned until Tuesday.

The section, on resuming after the excursions and visits of Saturday, Sunday, and Monday, took as the first paper one by Mr. A. Hessel Tiltman, architect, of London, on "Public Baths and Wash-houses." The suggestions of the author, based on a twenty years' practice as consultant and adviser in this class of buildings, and also based upon a five years' careful investigation of the principles of construction of institutions of the same kind in Great Britain, Ireland, France, Belgium, Germany, Austria, and Hungary, were confined to what he regarded as the necessary changes in the distribution, classification, and arrangement of future establishments. Out of 200 representative establishments visited during the period named, sixty were in Germany and Austria. The baths and wash-house movement had progressed so rapidly since its inception in 1846, that it now threatened to become unmanageable. Yet the administration of the Acts had partially failed, great as had been the work done, for an analysis of the attendances would show that only a small proportion of the persons for whom these establishments had been designed took advantage of them. The reasons were, in his opinion—(1) that the initial distribution of them was almost invariably at fault, and (2) that sufficient effort was not made to educate the masses to the necessity and benefits of the bathing habit. The mistake was usually made of not adequately considering the needs of the whole town or district before beginning building operations. Generally, there was found a tendency to follow blindly the example of neighbouring

towns, without consulting with those able to advise, with the result that old faults were repeated, and sometimes new ones added. The community to be catered for, included three classes, the middle, the working and the very poor classes, and the association of all the three classes together was, the author considers, the initial blunder. In this centralisation the legitimate requirements of no class were properly met, and the result to the ratepayers was the reverse of economical. The purely ablutionary baths should be decentralised, to form a series of small branch establishments to suit the convenience of the various localities, while the swimming baths should constitute central establishments with even better accommodation than was provided at present. The public baths and wash-houses would thus differ fundamentally from the central establishments; and a third class, the people's baths, would differ fundamentally from both the others. The latter would be very much smaller in size, and their more limited sites would need no special prominence.

The public baths and wash-houses would consist of buildings, accommodating in no case more than from thirty to fifty douche baths and a public wash-house of from thirty to fifty washing compartments, and their accessory accommodation, together with the necessary boiler and engine rooms, ticket-office, waiting-rooms, &c.; and the people's baths, of very small buildings, arranged in a manner very similar to the best of the continental types. The accommodation would consist of some twenty or thirty in number of the warm and cold "rain-douche" or shower baths, now very largely adopted throughout Germany and Austria, and more recently in the United States of America.

Our present large establishments at great distances apart did not attract the very poor bathers and washers, who more often than not fought shy of them. While in many of the features of our baths we need fear no comparison with Germany, the true spirit of our Baths and Wash-houses Act would be much better observed were we to adopt the practice of that country instead of obstinately adhering to our own. Among the most commendable features of the German establishments were the open-air swimming baths upon their rivers, some of them upon a very large scale, and of an excellence not approached in this country. Again, their general swimming baths were much better proportioned to the population than ours. They have smaller sites, are better warmed, and more adaptable for use all the year round. No bather is permitted to enter the pond until he has washed from head to foot under the warm douches. Mr. Tiltman is strongly in favour of the "rain-douche bath" advocated by Dr. Oscar Lassar, a well-known skin doctor, of Berlin. Dr. Lassar says of it:—"The cleansing is absolutely thorough, and is essentially promoted by the fact that all the dust and dirt with which the water becomes soiled is immediately carried away and continually replaced by clean water. In the use of the ordinary tub or slipper bath the bather always finishes up finally in dirty water, more especially the workman, who leaves all the accretions of an entire week in the bath. Moreover, the individual using a public shower bath is better guarded from infection, and from contact with the vestiges of his predecessor than in the slipper, as he can himself without trouble secure the cleansing of his cubicle by turning the shower nozzle over it." With this bath little or no attendance is required.

In Berlin, and many other parts of Germany, there are now a large number of very small establishments, fitted up with this apparatus only. They are arranged in a number of cubicles, for the double purpose of dressing and bathing. Each compartment, in its back division, is provided with a rain-douche apparatus, which, by means of a lever, gives unlimited supply of hot and cold water.

The supply of water forms the largest item of expenditure. In the two largest London establishments (both designed by the author) the annual water bill reaches 1,200*l.* each. A well supply should be obtained, if possible. In Glasgow, and many Continental towns, water was given free, and perhaps it was not too much to expect that the example should be largely followed by corporations who own their own establishments in this country.

A large number of plans were exhibited upon the walls and the tables showing the details of construction of baths and wash-houses designed and erected by the author in London, at Kennington-road, Hornsey-road, Tibberton-square, and also of baths at Berlin, Vienna, Hamburg, Frankfort, New York, and Brooklyn. Other plans illustrated the ideas of Mr. Tiltman for improved schemes in London and the large towns of Great Britain. Two sets of typical plans explained the general arrangement of one of his proposed branch establishments. In both sets of plans the public wash-house was on the ground floor and the douche baths on the upper floors. A new and very beneficial addition to the wash-house department was a public crêche where any washer having young infants with no one to take care of them at home might leave them free of charge during the time she is engaged in the wash-house. The People's Baths was another and smaller type of branch establishment, intended to provide in the cheapest manner for the very poor, to be placed at convenient and frequent intervals throughout very crowded districts.

Every part of the public baths, especially that used by the lower class of visitors, was subject to very rough treatment. The construction, therefore, should be of such a character as to resist the action of water in every form, whether from carelessness or from necessity of frequent cleansing. Every part should be comfortable in its arrangement and appointments, and yet easily kept clean and free from vermin, and especially so with respect to the transfer of contagious matter; and last, but not least, it should give the impression of neatness and scrupulous cleanliness in all its parts. The author said, in conclusion, that his views, expressed at much greater length before the Royal Institute of British Architects in February last, had received gratifying endorsement at the hands of professional brethren and in the press in England, America, and the Continent.

Mr. Brodie, C.E. (Whitehaven), who opened the discussion, inquired what would be the cost of the proposed bathing establishments per 1,000 of the population. An offer of baths had been made to the Corporation of Whitehaven, but the amount of money asked was so out of proportion that they were not purchased by the Corporation. At Whitehaven, having a large mining population, they must have more than one establishment. He was in favour of giving baths absolutely free of charge. They had a plentiful supply of water, and with one or two more months' working in the year they could give baths free. They had a population of 22,000, chiefly miners. They could not give a community a free supply of water because of the waste to which it would lead.

Mr. Dibdin (London) asked whether the author could tell him the cost of working the slipper baths and the ordinary swimming baths. He had no sympathy with the eternal cry of consideration for the ratepayers, when it was a question of performing an essential duty. They did not hesitate to cut through a block of buildings if a new street was a matter of necessity, and no man should fail to discharge the one essential duty of assisting the population to fulfil that of cleanliness. He did not care whether it paid or did not pay. Who would ask whether it paid to clean the streets? The duty of promoting public cleanliness of person was as great as the duty of keeping clean the public streets. Diseases of certain kinds, as they all well knew, were induced by dirt; and they gave a great amount of money for the upkeep of hospitals to cure those diseases, and they thus threw a considerable burden on the rates. It would probably be a good economy to build baths and to let them be used without charge.

Mr. Councillor McClean (Brighton) said it was a great credit to any Corporation to encourage children to learn to swim and to use the baths. The Corporation of Brighton, of which he was a member, had just passed a resolution to provide a tidal bath on the beach. They were considered slow in Brighton, but they thought baths, whatever they might cost, were necessary.

Mr. Ebbutt (Acton) pointed out that in comparing the cost of the old and the improved systems the author had left out one important advantage of the rain-douche bath, its small cost in the consumption of water. For each time it was used the rain douche-bath would only require about eleven gallons, instead of fifty or sixty gallons. He would like to know what material Mr. Tiltman thought the best for the margins of the ponds.

Mr. Alderman Carter (Leeds) said that of late years the Corporation of Leeds had gone largely into the question of public baths. They did not believe now that they could be made self-supporting. They had built five baths (one for each Parliamentary division), of a very cheap character. School children were admitted to the extent of 8,000 or 10,000 every day, and if under the charge of a responsible person, they only paid one penny. Annually they were used by about 286,000 persons, the receipts for the twelve months being to last March 3,489*l.*, while the expenditure had amounted to 4,504*l.* The Corporation did not consider this a loss; they regained it in the health of the people.

Mr. Tiltman then replied. He was sorry that his deafness had prevented him hearing all the questions that had been asked, but he would reply to such remarks as he had caught. The cost per 1,000 of the population could not be accurately stated until the administration had become more regular and consistent. No approximate estimate would be useful. Every town and every district would make its own arrangements, some having one establishment and some two or three. It was a difficult matter to find a good material for gangways, a stone non-slipping and of good colour. Hard York stone was the best. He knew of nothing so good or so durable. The bath performed a supreme duty and was as necessary as the doctor and it arrested mischief at an earlier point. The rate in the pound would vary according to the circumstances of each case. In four of his establishments in London—some of them among the largest in the world—it would average less than a halfpenny, but if consistently administered in towns and districts, it might possibly be no burden on the rates, but self-supporting.

The section then adjourned for the general meeting of the Congress, resuming in the afternoon tor the consideration of two papers which remained on the agenda, the first on the "Disposal of Sewage by the Vacuum System," read by Mr. Liernur, of Paris; and one on "Artisans' Dwellings," prepared by Mr. Brierley (Surveyor, Richmond, Surrey).

## Illustrations.

### NEW PREMISES, HANOVER-SQUARE.

THE drawing shows the proposed reconstruction of frontage of one of the older houses in this square.

The proportions are rather large and striking, in order to harmonise with the scale of the adjoining buildings. With the exception of the sculptured band over the first floor windows, the treatment has been kept severely simple. The material to be used is Portland stone.

Mr. John Belcher is the architect.

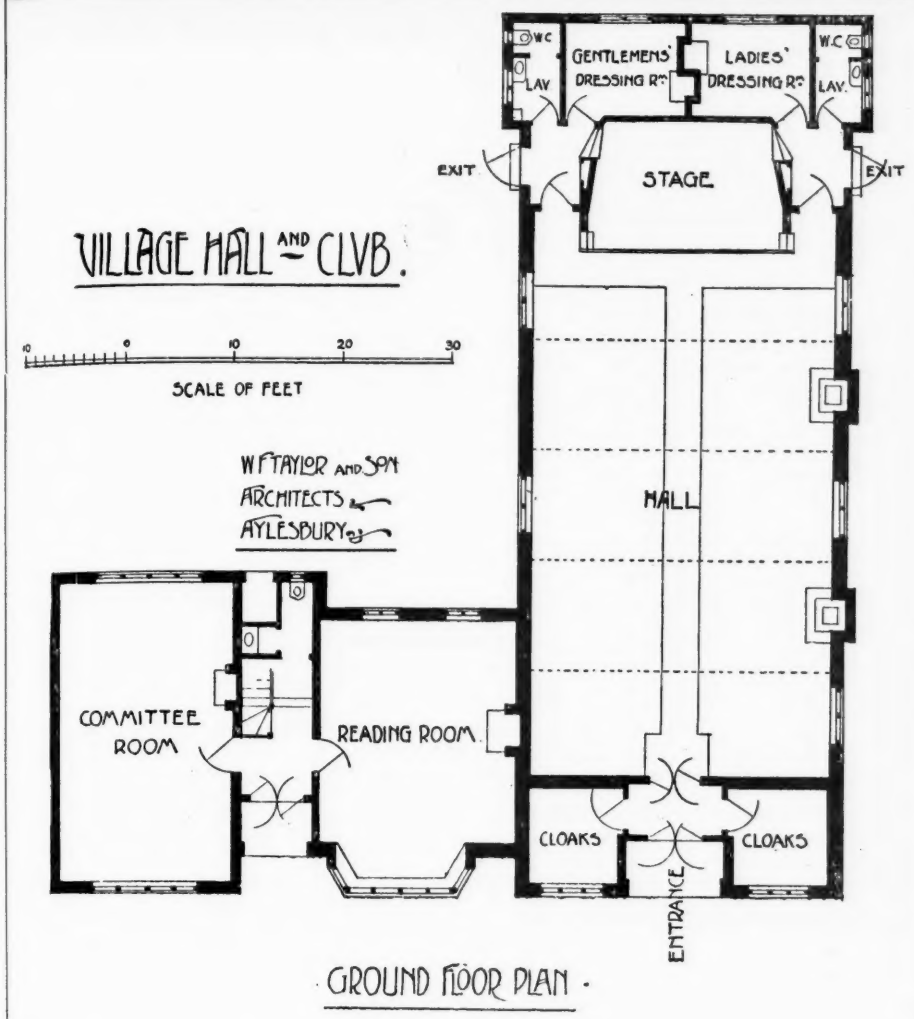
### ÉCOLE DES BEAUX-ARTS: FIRST PRIZE DESIGN IN ARCHITECTURE.

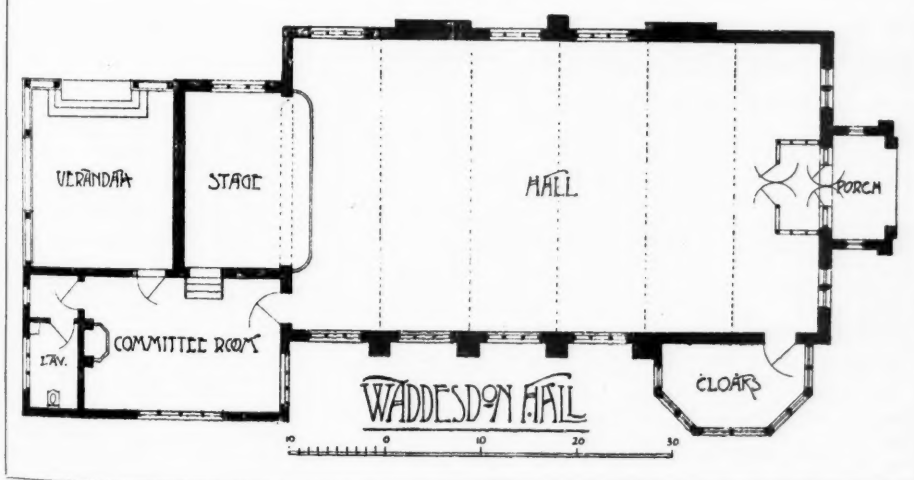
THE "Premier Grand Prix" in architecture this year at the École des Beaux-Arts, Paris, has been awarded to M. Tony Garnier for the design of which we give the ground plan and front elevation.

The subject given was "Un Hôtel pour le Siége Central d'une Banque d'État," or, as we have rendered it, "A central establishment for a National Bank." We give it simply as an architectural composition in plan and elevation; the details of the scheme given to the competitors were we believe very complicated, as to the requirements of the plan, but we are not in possession of these. The *crux* was to provide these requirements without departing from the character of classic symmetry which is in favour at the École des Beaux-Arts.

The absence of a scale on the design is according to the usual inconvenient practice of French architects, who only write in the corner of a drawing what the scale is. As there could be no scale in any case, we have given elevation and plan as large as the page would allow, without caring to keep the plan to the same scale as the elevation, which would have reduced it to a very small size. The elevation, as will be at once seen, is that of the front which forms the right-hand margin of the plan.

M. Tony Garnier was a pupil of the late M. Blondel and of M. Scellier de Gisors.




## HOUSES AT WALTON-ON-THAMES.

AN endeavour has been made in designing these houses to impart an individual character to them, by the treatment of the roof and the large wood bay windows of the drawing rooms.

The materials chosen are stock brick, rough casted on the ground floor, while Tilberthwaite green slates cover the roof.

The only decoration is confined to the lead-work below the cills of the dormer windows immediately over the front entrance doors.

The external woodwork is to be painted white, and leaded lights in iron casements glaze the windows. CYRIL E. POWER.

## VILLAGE HALL AND CLUB.

THIS design was submitted by Messrs. W. F. Taylor & Son in competition for a village Institute at Byfleet some eighteen months back.

It was proposed to use local red bricks and rough cast for the walls, and to cover the roofs with dark Broseley tiles. The authors intended to finish the interior woodwork with a green stain.

The estimated cost was about 2,000*l*.

## NEW HALL AT WADDESDON.

THIS hall was erected two years since on the south side of the main road in Waddesdon by the late Baron Ferdinand de Rothschild.

The building consists of a hall capable of seating 300 persons, with cloak-room, committee-room for use of Parish Council, and lavatories. The heating is by hot water, executed by Messrs. Clements, Jeakes, & Co., of Great Russell-street, Bloomsbury. There is a large covered way in the rear. The materials employed are red bricks and Monk's-park stone.

The roof has hammer-beam principals, and is covered with Broseley tiles; the lobby screen is Jacobean in character, and all the internal finishings are in pitch pine. The walls internally are finished with sgraffito decorations, executed by Messrs. W. Turner, Lord, & Co., of Mount-street, Grosvenor-square.

The entire cost was about 3,000*l*.

This hall is one of the many buildings erected in Waddesdon at the sole expense of the late Baron for the benefit of the villagers.

The architects are Messrs. W. F. Taylor & Son, of Aylesbury, and the builders, Messrs. Webster & Cannon, of the same place.

## SFORZA TOMB, SANTA MARIA DEL POPOLO, ROME.

THE tomb of Cardinal Ascanio Sforza, here illustrated, is the work of Andrea di Sansovino, It stands opposite another by Sansovino erected in memory of Cardinal Girolamo Basso, both put up by Pope Julius II., and whose arms (being of the della *Rovere* family), an oak tree (Latin *robur*), are to be observed in the shield under the tiara beneath the crowning figure representing God the Father.

Both tombs are in the choir of Sta. Maria del Popolo, Rome, behind the high altar, which is (as usual in Italy) placed in the choir just beyond the crossing. Both are executed in white marble, and the carving is delicately refined throughout. The figures emblematically represent the virtues of the Cardinal himself.

These monuments—a fine ceiling overhead, painted by Pinturicchio—the only good stained glass in Rome, the work of Claude and Guillaume de Marseilles, together with the quaint, quiet choir stalls and fittings of walnut wood—form together an interesting and beautiful whole. The interior of the church is a perfect museum of sculpture and painting, and forms a marked contrast with its plain, almost dull, appearance as seen without from the Pincian Gardens, at the foot of which it stands. Cardinal Sforza, a member of the great ducal house of that name of Milan, died at Rome in 1505. R. H. W.

## FIRE TEST WITH A FLOOR.

THE result of a test of a floor made by the Columbian Fire-proofing Company (Pittsburgh, New York, and London) is recorded in No. 23 of the British Fire Prevention Committee's Reports, and is worth special note, as the result was that after a fire test of two hours and a half, and flooding with water immediately afterwards, the floor remained intact as far as its structural strength was concerned.

The following is the description of the construction of this floor, as given in the Report:—

"On April 1, 1899, concrete slabs for the protection of the bottom flanges of the steel joists were moulded and allowed to stand until dry. The size of each slab was 16½ in. by 7¾ in. and 2 in. thick. They were made with very fine cinders, sharp washed sand, and Portland cement, in the proportion of four of cinders, two of sand, and one of cement, 4 gallons of water being used to every 3 cubic feet of material. The whole was turned over and mixed four times dry and four times wet. Anchors to connect the slabs to the steel joists were embedded in the slabs and were made with No. 16 hoop-iron ⅞ in. wide. The slabs were secured to the steel joists by bending down the hoop-iron anchors over the bottom flange of joists.

To give additional strength to the concrete slabs, four lengths of No. 10 galvanised wire laid lengthwise and four lengths laid crosswise, forming a netting, were embedded in each slab, and an air space to the bottom flanges of steel joists was provided in each slab.

On April 12 two American steel joists, 12 in. by 5 in., weighing 31 lb., per foot (supplied by the firm), were placed on the 4 in. offset of the walls. They were fixed running north and south, and 6 ft. centre to centre. On the top flange of each steel joist, steel stirrups of patented section, measuring 2 in. by 3 in. by 6⅜ in., and spaced 20 in. centre to centre, were fixed for the support of steel bars, 2 in. deep of patented section and weighing 2½ lbs. per foot, the bars, fixed transversely from joist to joist, are used for strengthening the concrete and become embedded in it as hereafter described.

On April 15 flat wooden centering was put up.

On April 17 the concrete was put in, which consisted of clinkers broken up to pass a ¾ in. mesh. The clinkers were obtained from the gas works at Kensal Green, and screened before using. The Portland Cement used was not selected, but was obtained in the open market. The sand was sharp pit sand washed. The concrete was 4 in. thick, and made in the proportion of four parts of clinkers, two parts of sand, and one part of Portland cement mixed four times dry and four times wet; 28 gallons of water to 1½ yards of material being used.

The clinkers were dry and the sand slightly damp before being used.

The concrete was carried to the floor in buckets, and well rammed down with a shovel and the feet on the centering. Great care was exercised in getting the concrete round the steel joists and bars, to completely embed them. No steel was left exposed.

On April 28 the centering was removed, and 2 in. by 3 in. fixing fillets (floor strips) were laid, 16 in. centre to centre, on top of the 4 in. concrete, and filled in between with coke breeze concrete 2 in. thick, making it level with the top of the fixing fillets,

The last-mentioned concrete was composed of clean coke breeze, sand, and Portland cement, in the proportion of five of coke breeze and one of Portland cement, 3½ cubic feet of sand, and fifty-two gallons of water being used to each 1½ yards of material, mixed four times dry and four times wet, well rammed down with a shovel and the feet. The cement used was the same as above.

On May 5 the first or pricking-up coat of plaster was put on. The plaster was made in the proportion of 1 yd. of unwashed pit sand, ¼ yd. of grey stone lime, and 21 lb. of cow-hair, thoroughly mixed with water and brought to a proper consistency.

The plaster round the steel joists was gauged with a small quantity of plaster of Paris.

On May 8 the second or floating coat was put on, the plaster for this was composed as described for the first coat.

On May 13 the finishing or setting coat was put on. This was made in the proportion of two parts of lime putty and one part of washed sand brought to a proper plastic condition with water.

The plaster when finished measured $\frac{7}{8}$ in. thick."

The result of the test, during which the heat to which the floor was exposed rose as high as 2,335 degs. Fahr., was that about one-third of the area of plaster coating had fallen off, exposing the concrete, and the rest was more or less damaged, but the whole of the concrete of the floor and sides of the beams was sound and good, and not disintegrated at any point.

## *ENGINEERING SOCIETIES.*

SOCIETY OF ENGINEERS.—A visit was made by the Members and Associates of the Society of Engineers on Tuesday, September 26, to the Machine Works of the Wicks Rotary Type-Casting Company and to the Works of Bischof's White Lead Syndicate, both in Hythe-road, Willesden Junction. The Wicks factory proved specially interesting, on account of the extremely fine work that has to be produced. Although the machines are simple in construction, they require to be made with the greatest possible accuracy, and the works are therefore a model in their way, some really beautiful machines being employed in the process of manufacture. The highest class machine tooling and hand fitting are done, and the best methods employed throughout. The necessity for this will be realised when it is remembered that the casting machine has to produce, at one operation and at a high rate of speed, such a delicately accurate thing as a printers' type, in which the variation of even a thousandth part of an inch is fatal to accuracy. The Wicks type-casting machine consists of a horizontal wheel of moulds, a reservoir of type metal, together with the necessary accessories, mounted on a cast iron framing. It stands about 4 ft. high over all, and occupies a floor space of 5 ft. 6 in. by 3 ft. The molten type metal is forced from the reservoir by a small but powerful pump, through an aperture in a steel shield, into each of 100 moulds in succession. The moulds are arranged in the periphery of the horizontal wheel of moulds to which a continuous revolving motion is imparted. At the back end of each mould is the matrix with the letter, figure, or sign to be cast formed in it. The molten type metal is treated by the pumps as if it were water. It is pumped in a continuous stream through a tenth of an inch orifice, and is forced under a pressure of 250 lbs. per square inch into each of the 100 moulds—the size of which is that of the body of the type—as it passes the little aperture in the shield. The pump pressure has been gauged up to 600 lbs. per square inch, but the average pressure is 250 lbs. When the wheel has made about half a revolution, the heel of the matrix comes against an eccentric which presses the matrix forward and gently pushes the type outwards. By an ingenious arrangement of cutters the groove is then formed in the heel of each type, and one or more nicks, as may be necessary, are cut in the sides of the type body. Under one of Mr. Wicks's patents the grooves and nicks are formed during casting, whilst under another they are cut after partial ejectment. This latter, being the more economical method, has therefore been adopted. As the wheel of moulds completes its revolution, the matrices are gradually withdrawn into their normal position, leaving the mould ready for the next charge of metal as it passes the aperture in the shield. The finished types, on being finally ejected, are deposited on an ingeniously arranged travelling chain, which takes hold, so to speak, of each individual type, carries it forward, and deposits it on a tray. When a sufficient number of types have been collected, they are removed and sent to the sorting-room. The machine is provided with a complete system of cold-water circulation, by means of which a constant stream is always passing through the wheel of moulds and preventing over-heating. Every kind of type can be cast by this machine, a whole fount, consisting of all sorts of letters, figures, and signs, being produced by one wheel at every revolution. The rate of production is very rapid. The machine turns out 100 types at each revolution, and as with what is known as pica type the speed is ten revolutions per minute, it follows that the output with this type is 60,000 per hour in ordinary working. With smaller types higher rates of production are attained. The Wicks rotary type caster consists of 1,280 separate parts, exclusive of the 340 matrices which are required for each fount. The drawings issued to the shops are all dimensioned to three and often four places of decimals, and the men are expected to work accurately to the figures supplied. The heavier working parts are allowed to pass three-thousands loose, but most of the machined parts are made to gauges and must be correct to the one-thousandth of an inch. It is found in actual practice that the whole of the chain, chain-race, cam side plates and delivery arrangement must be absolutely right to the one-thousandth of an inch, and this is accomplished direct from the machines without any hand-work. The moulds involve a fineness of accuracy which is perhaps unequalled in engineering work. The segments are measured by a machine which is ten times as sensitive as a micrometer, and which is so constructed that only just one portion can be touched by hand, as the heat from the hand is found sufficient to put it out of truth. These segments (which help to form the moulds), together with their respective matrices, are actually made and tested to the ten-thousandth part of an inch, a Whitworth straight edge being used which shows defects to a thirty-thousandth. Four hundred sides, in all 1,200 operations are necessary at this degree of accuracy before the moulds are complete.

# Correspondence.

***To the Editor of* THE BUILDER.**

*Re* ATHENÆUM CLUB.

SIR,—After reading the additional statement of Mr. Collcutt given in this day's *Builder*, I hasten at once to express my regret at having wrongfully imputed to him "unprofessional conduct."

Had he given in his former statement the details of his communication with the committee when they consulted him in June, 1898, which he now gives, I should not of course have done so.

I still think, however, that he might have called on me to explain his unusual position, and the (as I still think) unjust action of the committee towards me in which he was innocently involved; as I should then have known, as I now do, that my grievance was with the committee only and not with him.

Mr. Collcutt's present statement makes the conduct of the committee (so deliberately unfair to me) more clear than ever, showing that they realised that I should feel "aggrieved," and yet they acted as no private gentleman would be expected to act towards a professional man.

CHARLES BARRY.

September 23.

## BOOKS RECEIVED.

ELEMENTARY PRACTICAL MATHEMATICS. By Frank Castle, M.I.M.E. (Macmillan & Co.)

MAGNETISM AND ELECTRICITY FOR BEGINNERS. By H. E. Hadley. (Macmillan & Co.)

A MANUAL OF HISTORIC ORNAMENT. By Richard Glazier. (B. T. Batsford.)

SHIPPING MARKS ON DEALS, BATTENS, &C. (W. Rider & Son.)

IMPROVEMENTS IN SWANSEA.—On the 21st ult. Mr. Percy Boulnois held a Local Government Board inquiry at the Guildhall, Swansea, in respect to an application of the Corporation to borrow 9,845*l.* for the purchase of land for street improvements, 890*l.* for the provision of underground lavatories in Alexandra-road, and 500*l.* for the purposes of laying out walks and pleasure grounds.

# The Student's Column.

## ROADS: THEIR CONSTRUCTION AND MAINTENANCE.

**PART III.—CONSTRUCTION** (*continued*).

### 14.—SELECTION OF ROAD-LINES.

THE business of road construction falls naturally under two heads, viz., the laying out of new roads, and the improvement and maintenance of old ones. Although the latter problem will more frequently confront the road student than the former in a settled country like our own, occasions will also arise when new roads are required to be laid out. We shall, therefore, deal first with the considerations which should influence the selection of road-lines. This is the more necessary, as new roads are often left to be set out by estate agents, who are not seldom compelled by the circumstances of the case to ignore engineering difficulties, which, when it is too late to remedy them, present formidable obstacles, involving either a large outlay to overcome them, or else an inferior road, which for all time is a source of inconvenience and expense.

The problem of road location is not usually so simple as it might at first sight appear to be. The mere connecting together of two points by a straight path or roadway, although a plan often adopted in practice, is not always the most desirable method to be employed, even in a short estate road; and in the case of a long line of road, extending over a considerable range of country, is generally impossible. As the latter case practically embodies all the important points which can arise in short roads, it will be advisable to consider here the complete question of road location as applied to extensive tracts of country, presenting all the usual diversity of physical features which may be met with either at home or abroad. The question of pioneer roads in unsettled countries of course differs somewhat in detail from that of properly-metalled highways in inhabited districts; but in the principles bearing upon the selection of route there is but little difference between them, as, in the course of time, the former naturally develop into the latter, in proportion as settlement proceeds and town sites are developed.

The points for consideration in laying out a line of road fall under the following heads:—

1. The limiting gradient;
2. The cost of overcoming natural obstacles;
3. The reduction of distance to a minimum, so far as other considerations permit.

These different elements are often in conflict, and there is generally considerable difficulty in reconciling them so as to secure the most advantageous route. In any ordinary country it is generally impossible to make a road at the same time both straight and level without incurring a prohibitive expense in cuttings, embankments, insecure foundations, and drainage. The Romans paid more attention to straightness of direction than to undulations of the surface, and were not deterred by gradients which would not be tolerated in these days. Indeed, it often happens that distance is not saved by this means, the undulations in a vertical plane causing quite as long a road as the horizontal curvatures necessary to secure easy natural slopes. In other words, it is often no greater distance to go round a hill than over it. Even without considering gradients at all, straight roads are often impossible, owing to the necessity of serving other towns lying near the line of route. In a new country the situation of townships is often determined by the position of the pioneer roads; but in an old country the reverse is usually the case, the position of any new roads being dependent upon that of the towns. In the latter case, also, the value of land sometimes enters into the question and renders the shortest distance impossible.

Before entering into a detailed discussion of the important subject of laying out a road, it is necessary to say a few words about maps. A good map is absolutely essential in the preliminary stages of fixing the position of a road. This map must not only be topographically correct, but it must also show by contours, hachures, or mezzotint the surface undulations of the country. For this purpose contours are far superior to any other method; since it is only by this means that the true shapes of the hills and valleys can be properly appreciated.

Contours, as the reader probably already

knows, are lines of equal altitude. They represent imaginary lines running round a hill at the same level all the way, each contour representing a fixed rise or fall of so many feet. They serve the purpose, therefore, of enabling the direction of perfectly level pathways to be seen at a glance. A road following a contour must be absolutely level. Such roads will be alluded to later as "contour roads." Contours also enable the height of any spot on a map above any other point to be readily calculated, by counting the number of contours between them.

The methods of representing surface features by hill shading, such as hachures or mezzotint, are sometimes adopted even in contoured maps, in order to afford an appearance of greater surface relief than the contours alone afford. In many cases, however, this is the only way in which any attempt is made to represent surface features. By means of a scale of shade some general idea of the slopes can be gained from such maps, if the hill shading is correctly graduated; but as the different depths of shading merge almost imperceptibly into one another, there is no definite conclusion to be drawn as to the precise elevation of one spot over another, or even as to the exact localities where the slopes begin to change. Hill shading, therefore, cannot be recommended as a substitute for contour lines, but may, if desirable, be used in addition to these, to accentuate the features, which to an experienced eye contour lines alone show with sufficient clearness.

No better examples of maps suitable for road construction exist than the Ordnance Survey maps of our own country, which can be procured on several scales according to requirements. Those drawn on a scale of 1 in. to the mile are most suitable for large areas of country; but for smaller areas the 6 in. maps are preferable, and for estate work the parish maps of 25 in. to the mile are not too large. The contours are generally drawn on the 1 in. and 6 in. maps at vertical intervals of 50 ft. For road purposes this is generally too large an interval, as many of the minor features of the surface are thus suppressed. Extra contours, however, can without much difficulty be added by any one possessed of a knowledge of the principles of levelling, a subject which limitations of space prevent enlargement upon here. In pioneer work in the Colonies and elsewhere such elaborate maps are of course not to be had; but rough maps, sufficiently accurate for the purpose, are usually constructed in the course of the preliminary survey.

The reading of a contoured map is soon acquired by practice. As a rule, the altitudes are figured on each contour line. Even if they are not, the position of the watercourses will be at once evident, and from these the position of the higher ground may be inferred. It will be noticed in every case that the ground falls towards the natural drainage channels, which are separated from one another by more or less elevated ridges running between them. The lowest parts of the country represented on the map should first be recognised by means of the main rivers and their tributary streams. From these the eye will readily distinguish the watersheds and the hillocks, the relative heights of which may be calculated by counting the number of contour lines from any convenient level. The difference in level between two places is found by multiplying the number of intervening contours by the vertical height between the contours, called the vertical interval.

A knowledge of the shape of the ground is gathered from the distance of the contours from one another. The steeper the slopes the closer will the contours be, and *vice versâ*. If in a hill the upper contours, near the summit, are closer together than those near the bottom, the intervening ground is concave. If, on the contrary, the lower contours are closer than the higher ones, the ground between them is convex.

A more graphic method of showing the general shape of the surface in any given direction is by drawing a profile or section, which can be easily done from a contoured map in the manner represented in the accompanying diagram (fig. 1). Here we may imagine that we require to know the shape of the ground along the dotted line AB. The contours show that the ground rises from A to B, and also that a small isolated elevation occurs at C. The greater proximity of the contour lines towards B also shows that the rise is steepest in that locality. To obtain the section, we draw parallel lines at a distance apart which represents the vertical interval between the contours on any convenient

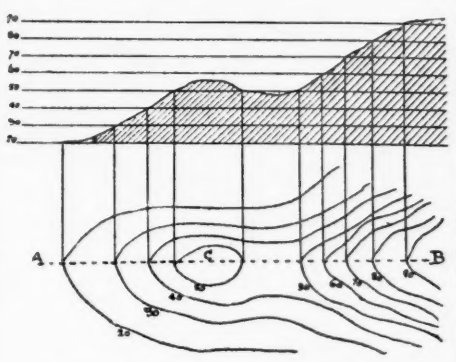



*Fig 1.—Road Profile: Vertical Scale exaggerated.*

*exaggerated* scale. These lines are numbered to correspond with the numbers on the contour lines. From each point on the line AB, where it intersects a contour, vertical lines are drawn to intersect the corresponding horizontal line. The tops of these perpendiculars are connected by a continuous curve, remembering the rule given above as to the distinction between convex and concave surfaces. Thus, to the left of the hill C the ground is slightly concave, since the contours are wider apart below; but towards the rising ground at B, the ground is convex, since the lower contours are closer together than those at higher levels.

The shaded profile thus obtained in fig. 1, gives the relative heights of different points in the line AB, *but it does not give the true gradient.* This last distinction is of great importance. The true gradient cannot be represented in section accurately unless the vertical intervals are drawn on the same scale as the horizontal scale of the map. If this is done, the elevations will generally be so minute that the profile will not give a sufficiently striking representation of the surface features, which in many cases would be scarcely perceptible. It is, therefore, necessary to exaggerate the vertical scale in a certain fixed proportion, and to mark on the profile the amount of exaggeration.

It is enough, however, for road-making purposes, to know generally whether the ground is steep or flat; it is also necessary to know what is its exact shape, and what is the degree of slope at any given spot. This can easily be done from a contoured map if we know (*a*) the scale of the map, and (*b*) the vertical interval between the contours. There are two ways in which gradients may be expressed. Either the difference in level may be stated which occurs in a certain horizontal distance. This is usually given as a fraction. Thus a gradient of $\frac{1}{30}$, or 1 in 30, means a rise of 1 ft. vertically in a distance of 30 ft. horizontally. Or the slope may be expressed in degrees of elevation above the horizontal plane.

Thus a slope of one degree represents a rise of one foot vertically in a distance of 57·3 ft. horizontally; since, as the mathematical reader will know, 57·3 is approximately the natural co-tangent of an angle of one degree A slope of one degree is, therefore, very nearly equal to a rise of 1 in 60, which for rough mental calculations is sufficiently accurate. In this way we can readily compare the two methods of expressing gradient, thus :—

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 deg. | is equivalent to | 1 | in | 60, | or | 1·6 per cent. |
| 2 | „ | „ | „ | „ 1 | in | 30, „ 3·3 „ |
| 3 | „ | „ | „ | „ 1 | in | 20, „ 5 „ |
| 4 | „ | „ | „ | „ 1 | in | 15, „ 6·6 „ |
| 5 | „ | „ | „ | „ 1 | in | 12, „ 8·3 „ |
| 6 | „ | „ | „ | „ 1 | in | 10, „ 10 „ |

The exact gradient on a contoured map may be easily calculated from the map scale. Thus, suppose the distance between the contour lines on each side of the given locality to be 200 yards on the map scale, and the vertical interval to be 20 ft., the gradient is then obviously $\frac{20}{3 \times 200} = \frac{1}{30}$. This method involves a special calculation for every gradient. A much more convenient plan is to make for the map a scale of slopes, from which the steepness of the ground can be at once determined. This scale, sometimes called the scale of horizontal equivalents is made in the following manner. The accompanying map (fig. 2) is drawn and contoured on what is called the normal system. The scale of the map is 6 in. to a mile, and the vertical interval between the contours is 20 ft.

Now 1 deg. being a rise of 1 ft. in 57·3 ft., in order to rise 20 ft. on a slope of 1 deg. a horizontal distance of 57·3 × 20 = 1,146 ft., or 382 yards will be necessary. On a slope of 2 deg. the vertical height of 20 ft. will be reached in half this distance, that is, in 191 yards; and on a slope of 3 deg., in one-third the distance, or 127 yards, and so on. There is a slight but inappreciable error in this method, which, however, can be used for slopes up to 20 deg., an inclination very far beyond the limits of practical road construction. We thus arrive at the following horizontal equivalents for a scale of 6 in. to a mile :—

| Angle of Slope. | | Horizontal Equivalent for 20-ft. Contours. | |
|---|---|---|---|
| 1 deg. | ..... | 382 | yards |
| 2 „ | ..... | 191 | „ |
| 3 „ | ..... | 127 | „ |
| 4 „ | ..... | 95·5 | „ |
| 5 „ | ..... | 76·4 | „ |
| 6 „ | ..... | 63·6 | „ |

These distances are laid down on the map scale, thus giving the scale of slopes shown in the figure.

If we now wish to determine the slope at any portion of the map, we have only to take off the distance between the contours at that place and ascertain which division of the scale of slopes most nearly corresponds to it, see fig. 2.

The great value of a scale of slopes lies in the fact that the eye readily accustoms itself to recognise the steepness of the ground without actually measuring the distance between the contours. A contoured map thus becomes an accurate delineation of the country in true relief, in which all the variations of gradient are as readily perceived as they would be in a field survey.

If the map is not drawn on the normal system, the horizontal equivalents can be determined by calculation, using the formula $H.\ E = \frac{19{\cdot}1 \times v.\ I}{D}$, where the vertical interval is expressed in *feet*, and D is the angle of slope in degrees. The value of the horizontal equivalent is thus found in *yards;* but the normal scale given above can be used for all maps, whatever the scale may be, if the vertical interval is varied in inverse proportion to the map scale. Thus a map drawn on the scale of 12 in. to a mile, which is twice the normal scale, would then have its contours drawn at intervals of 10 ft., instead of 20 ft. The normal scale would then apply.

*Limiting Gradient.*—We have now to consider how surface slopes affect the question of road engineering. It is difficult to fix any rule as to the maximum steepness of slope which is permissible in a road, as gradients which would be considered high in a level country, would be impossible to maintain in hilly districts. Nevertheless, there are limits beyond which traction is either impossible or economically undesirable.

The experiments of Parnell and Gayffier show the influence of slopes on the powers of traction of a horse. Their results are given in the table below.

| Rate of Inclination. | | Angle of Slope. deg. | ft. | in. | | Proportionate Power. |
|---|---|---|---|---|---|---|
| 1 in 100 | ..... | 0 | 34 | 23 | ..... | ·9 |
| 1 in 50 | ..... | 1 | 8 | 6 | ..... | ·81 |
| 1 in 40 | ..... | 1 | 25 | 57 | ..... | ·72 |
| 1 in 30 | ..... | 1 | 54 | 37 | ..... | ·64 |
| 1 in 26 | ..... | 2 | 12 | 2 | ..... | ·54 |
| 1 in 20 | ..... | 2 | 51 | 21 | ..... | ·4 |
| 1 in 10 | ..... | 5 | 42 | 48 | ..... | ·25 |

By which we see that on a slope of 1 in 10 a horse can only draw one quarter of his maximum load. Even a strong horse dragging a load of one ton will rarely face a gradient of 1 in 20 without tacking from side to side. Some horses might draw a light load for a short distance up an incline of 1 in 10, but the expenditure of energy is not good for the horse, and the wear and tear on the road is excessive. There is also the question of loss of time to be considered. A horse may be easily made to trot on a grade of 1 in 30, however long it may be, and for a short distance on a slope of 1 in 25, but at a greater inclination than this a walking pace only will be generally possible. Inclined roads are equivalent to lengthening the distance. Sir J. MacNeil has shown by experiment the effect which slopes exert upon both heavy and light

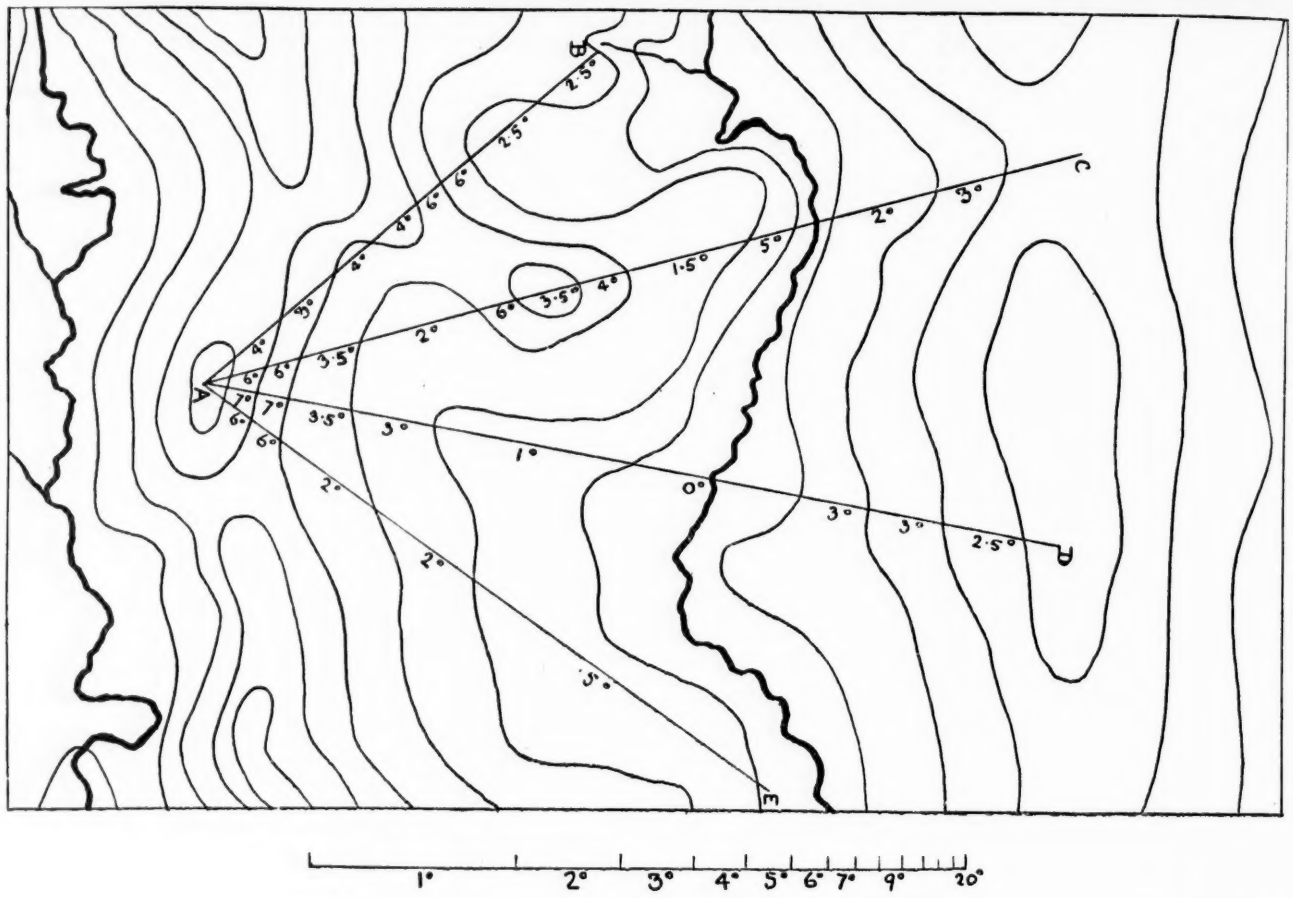



*Fig. 2.—Map Contoured on the Normal System, with Scale of Slopes.* [*See preceding page.*

traffic, the total force required being equal to that which is necessary to drag the load along a corresponding level road in addition to the force required to lift the load through the given elevation. For example, on a slope of 1 in 30, the equivalent length of horizontal road is 2·7 miles for heavy traffic and 1·6 miles for lighter traffic. That is to say, the same force which would in the former case draw the load for one mile up a slope of 1 in 30 would draw it along the level for 2·7 miles. Thus a vertical rise is equivalent to a proportionate increase in road length.

It might at first sight be thought that the loss of energy incurred in ascending slopes would be regained on the descent. This, however, could not be the case unless the vehicle were allowed to descend the slope with a velocity unchecked either by the application of a brake or by the resistance of the horse.

It is usually stated that the inclination of a descending slope should not exceed the angle of repose of the vehicle. This angle, however, is very variable, depending upon the nature of the vehicle and the condition of the road. It may be measured by that proportion of the whole weight of the load which is necessary to overcome friction on a dead level. Thus, if a force of 100 lbs. will just move a weight of 3,000 lbs. along a level road, the angle of repose will be $\frac{100}{3,000}$ or 1 in 30. In practice this angle varies too much to be of any use. Besides economy in traction power gradients also exert an influence upon the expense of maintenance. Steep slopes increase the rate of wear not only on account of the greater abrasive influence of horses' feet, but also from the use of skids on the descent. It was held by Sir J. MacNeil that gentle slopes of 1 in 40 cost $\frac{1}{5}$ less for repairs than those of 1 in 20.

At the same time a dead level appears to be more fatiguing to horses than alternate slopes of slight gradient.

Both the opinions and practice of engineers differ as to the maximum slope which is permissible, since a great deal depends upon the kind of traffic as well as the character of the road surface. Light traffic and smooth surfaces both tend to minimise the evils of steep gradients. In fairly level country it is usually held that gradients should not exceed 3 per cent. or 1 in 33. A 5 per cent. gradient, or 1 in 20 on the other hand is often unavoidable in hilly country.

## *OBITUARY.*

MR. EDWARD CASE.—We regret to announce the death of Mr. Edward Case, C.E., which occurred on Saturday last at his residence in Dymchurch, Kent. Within recent years, Mr. Case became well-known in engineering circles in consequence of the highly successful results achieved by him in connexion with coast defence works. It was his intention to read a paper on this interesting and important subject at the Dover meeting of the British Association, but the relinquishment of the engagement proved necessary owing to the recurrence of heart affection, from which he had previously been suffering. Returning home from Dover on Thursday, more severe attacks followed, and after retiring for a short rest on Saturday afternoon, he quietly expired in his room. Mr. Case was a native of Maidstone, were for many years his father was town clerk. Articled to the County Surveyor of Kent in 1860, Mr. Case assumed a position at the Maidstone Waterworks at the termination of his pupilage, and was subsequently associated with the Public Works Department of Ceylon as a superintending civil engineer. Returning to England he commenced practice as a consulting engineer in London, and in 1890 was appointed to the ancient office of Expenditor to the Lords of the Level, who are the modern representatives of the twenty-four jurats "chosen time out of mind" for the administration of Romney Marsh. At the time of his succession, Mr. Case found the great sea wall to be in a very bad state, owing to the wasting away of the foreshore, and to undermining at the foot of the paved slope. In many parts the pitching was utterly worn out, low water-mark had advanced fully 300 ft., and the depth of water had been considerably increased. The first efforts made by the new Expenditor were of a tentative nature, being mainly directed to checking the spread of damage, but after two years of careful observation, he came to the conclusion that the design of the wall was bad, and that besides working its own destruction it had also destroyed the foreshore. Consequently in 1892, Mr. Case presented reports to the "lathe," or meeting of the Lords of the Level, in which his views were clearly stated, and the recommendations were (1) that the apron or toe wall should have a more gradually decreasing inclination, according with the elliptical form of the foreshore; (2) that a gradual and progressive system of groyning should be established to encourage the accumulation of sand; and (3) that certain sluice channels should be extended to avoid injury to the foreshore and the wall. These reports were adopted, but the necessary funds were not forthcoming, either for rapid progress or for the construction of groynes. A stormy winter following in 1893-4 caused much damage to the incomplete works. The Lords in consequence held a special meeting at which they decided to consult Mr. Matthews, of the firm of Coode, Son, & Matthews. Afterwards, at the suggestion of this gentleman, Sir John Wolfe Barry was also called into consultation. These experts advised the restoration of the slope—of course at a proper angle—and the erection of forty-three groynes, the total estimated cost being 40,000*l.* Thus it is seen that the advice of Mr. Case was practically confirmed by two of the most eminent engineers of the day. In the end, the Lords of the Level decided upon the construction of the less costly works recommended by their own engineer. Briefly, what Mr. Case did, was to make good with concrete all damage, to extend the sluice runs, and to construct low groynes from the toe wall to low water mark. More reliance was placed by Mr. Case on the accumulating effect of groynes than on extensive and costly alterations to the sea wall, and subsequent experience has proved that he was right. His groynes were of the simplest possible construction, being formed of battens bolted together, with distance pieces at the top and sole pieces at the bottom, spaced 7 ft. 6 in. apart. Length varied from 400 ft. to 600 ft., and the groynes were placed at intervals of from 300 to 500 ft. along the shore. The upper end of each was at mean high water level, and the lower end as far below low water level as possible. At first the height above the beach was not more than 2 ft. 6 in. but as shingle and sand gathered it was correspondingly raised. Since 1894 the groynes have been extended as low water mark receded, until their length in some cases is now as much as 1,000 ft. The total number of groynes laid down is 176, and their collective length about ten miles. As to the valuable nature of the work done by Mr. Case, we may mention the fact that in some places the level of the foreshore has been raised as much as 8 ft., and that the slope has been covered with sand 50 ft. in width. The foreshore is now built up to its natural angle of repose, which is not disturbed by gales from any quarter, and, instead of being running sand and mud, the beach is now a well consolidated mixture of shingle and sand. The work is not yet finished, but before his regrettable decease the founder was gratified by abundant evidence that its ultimate and complete success would be merely a matter of time.

MR. W. W. POCOCK.—Mr. W. Willmer Pocock, whose death was briefly announced in the daily papers last week, was, we believe, at the time of his death, at the age of eighty-six, the oldest member of the Institute of British Architects. He was the son of William Fuller Pocock (also an architect and who became a member of the Institute), and was born at Powis House, Knightsbridge, in the year 1813. He was educated at the school of the Grocers' Company (to which his father was the architect) at Aldenham. From there he went to King's College, London, and obtained his A.K.C., after which he passed at the University of London, and was among the first batch of students who obtained the B.A. of that University. He was particularly distinguished in his Greek, and obtained a

silver medal for a prize essay in that language. He entered the architectural profession and was for some years in his father's office, and finally succeeded to the practice. After living at Knightsbridge for some years, he went to Guildford, which borough he twice contested in the Liberal cause, though unsuccessfully, being beaten on the last occasion by Mr. Bovill, Q.C., who afterwards became Attorney-General. Leaving Guildford, he went to live at Chertsey (Three Bridges) and thence to Wandsworth. On the death of his wife in 1889 he bought a large house at St. Leonard's-on-Sea, and retired there to live, but also bought a small property at Tunbridge Wells where he spent the summer and where he died on the 18th inst. He was a member of the Worshipful Company of Carpenters, and was Master in 1883. As an architect he was very successful, and will be remembered chiefly for the building of Spurgeon's Tabernacle, which was said to possess the best acoustic properties of any building of its size and kind in the world; and also for Carpenter's Hall, London Wall, a dignified building in the old classic school, and which does every credit to its designer. He also built many Methodist chapels, among others the Central Chapel at Hastings and the Wesleyan Chapel and Soldiers' Home at Aldershot.

## *GENERAL BUILDING NEWS.*

METHODIST CHURCH, WASHWOOD HEATH, BIRMINGHAM.—The new church which is being erected in the Washwood Heath-road will seat 400 people. It is being built of red brick with terra-cotta facings. The contractor is Mr. Thomas Johnson and the architects are Messrs. Ingall & Son, of Birmingham.

FREE CHURCH, SHETTLESTON, LANARK.—The memorial stone of Shettleston (Sandyhills) Free Church was laid recently. The building, of which Mr. Petrie, of Glasgow, is the architect, will seat 760 persons.

NEW CHAPEL, ST. ANNE'S PARK, BRISTOL.—On the 20th inst. the new chapel at St. Anne's Park was dedicated. The building comprises a school chapel, measuring 40 ft. by 28 ft., with seating accommodation for 200 to 250, and, in the rear, a vestry, with kitchen and lavatory accommodation. The style is Perpendicular Gothic, the walls being built of red pennant with freestone dressings. The large room has an open boarded roof and pitch pine dado. The floors are of pitch pine blocks, and the windows are glazed with leaded lights. The work has been carried out by Mr. E. C. Norris, and the architects were Messrs. La Trobe & Weston.

WESLEYAN CHAPEL, HALIFAX.—The opening service in connexion with Trinity Wesleyan Chapel, Halifax, took place on the 21st inst. The new chapel, which has a frontage to Pellon-lane at its junction with Queen's-road, has been erected from the designs of Messrs. Utley, Hebblethwaite, & Utley, Halifax. The cost is estimated at about 4,500*l.*, and sitting accommodation is provided for 600 persons.

CHURCH, CHORLTON-CUM-HARDY, LANCASHIRE.—A church is being erected in Wilbraham-road, Chorlton-cum-Hardy, for the new parish of St. Werburgh. The architect is Mr. R. Bassnett Preston, of Manchester.

ROMAN CATHOLIC CHURCH, KILCOO, CO. DOWN.—The foundation stone of the new Church of St. Malachy, Kilcoo, was laid on the 17th inst. The style of architecture is perpendicular Gothic. The church comprises nave, 98 ft. by 35 ft.; sanctuary, 24 ft. by 18 ft.; sacristies and tower. The height of roof from floor line is 40 ft. to inner ridge and 51 ft. to outer ridge. The principal entrances are in the west front and tower—both through arched doorways, screened from the interior by framed enclosures. The nave is divided into six bays on each side, each bay having a two-light traceried window in its centre, the exterior face of wall being broken by weathered buttresses, which rise to nave. On each side of the chancel piers and within the sanctuary enclosures are the spaces for side altars. The sanctuary is square on plan, and is lighted by three single light traceried windows. Over the projecting doorway of west front the wall is pierced with a two light traceried window flanked by two single light windows, and the angle buttresses are carried over eave level and terminate in pinnacles. The barges of the gables are surmounted with cut stone crosses of Celtic design. The tower is placed on the south side, and is 9 ft. square internally, and is carried to a height of 90 ft. The stairs in tower give access to a gallery in the west end, and also to the belfry. The roofs are waggon-shaped, having main or intermediate principals and carved braces, and the ceilings are formed with geometrical pattern panels, which are filled with Carolina pine sheeting. Pitch pine is the material used throughout the building. The floor space not occupied with the benches will be laid with Terrazzo marble pavement, whilst that of the sanctuary will be laid with wood-block flooring. The windows will be filled with lead lights of ornamental designs and of a separate pattern for each window. The walling is of rock-faced ashlar and dressings, all of Ballymagreehan granite, supplied by Mr. M'Evoy. The architect is Mr. J. J. M'Donnell, of Belfast, and the contractors are Messrs. W. J. Campbell & Sons.

NEW BOARD SCHOOLS, BRISTOL.—The St. Anne's Park Schools, now being erected for the Bristol School Board, are designed on the central-hall system, and arranged for the future accommodation of 1,000 children. The portion now being proceeded with consists of central hall and class-rooms for 250 infants, central hall and class-rooms for 310 mixed (each with cloak and teachers' rooms, latrines, &c., complete), cookery-room and offices, and caretakers' house. The exterior is treated with rock-faced red pennant stone, with rusticated freestone dressings. The roofs to central halls are of hammer-beam construction, with polygonal shaped ceilings, which, with the ceilings of the class-rooms, together with the joinery, is of pitch pine. The windows generally are supplied with N.A.P. fittings. The total cost of the first section (which stand upon over an acre of land), inclusive of boundary walls and playgrounds, will be about 8,000*l.*, exclusive of site. Messrs. Wilkins & Gosling, of Ashley-road, are the general contractors; Messrs. Luckey & Co., St. Paul's, the plumbing; and Mr. James Cooper, C.E., of Birmingham and Bristol, the heating. The architect is Mr. William Paul, of Bristol, who also prepared the quantities.

COUNTY SCHOOL, EBBW VALE, MONMOUTH.—These schools, which were opened on the 19th inst., provide accommodation for sixty boys and forty girls. There are four class-rooms, two of which are convertible, by means of folding partitions, into one large assembly-room. Provision is made for music and art room, cookery, laundry, and scullery, chemical laboratory and workshop, and hat and cloak rooms for boys and girls respectively, and rooms for masters and mistress. There are separate entrances for boys and girls, and the cookery, laboratory, &c., form separate wings to each department. The building is of Ebbw Vale buff brick, with bands of red and dressings of Bath stone. Internally the joinery is of stained Oregon pine, the corridors, cloak-rooms, and laundry are laid with granolithic concrete, and the floors generally are of wood blocks. The contractors were Messrs. Lawson & Co., Newport, and the joint architects Mr. J. H. Phillips, Cardiff, and Mr. F. Baldwin, Brecon.

COTTAGE HOSPITAL, WOKING.—The Victoria Cottage Hospital, erected as a Diamond Jubilee Memorial, and opened recently, occupies a site with a frontage to Chobham-road of 109 ft. and a depth of about 520 ft. The building measures 92 ft. by 97 ft., with a height of 37 ft., and is set back some distance from the roadway. There are two main wards, one on either side of the central portion of the hospital, which consists of three stories. The wards are but one story high, and each measures 27 ft. by 22 ft., and contains six beds. There is a single ward for accident and other special cases immediately on the left of the main entrance to the hospital, bringing the total number of beds up to thirteen. There are also matron's, nurses', and servants' rooms, operating-rooms, &c. The builders were Messrs. J. Harris & Son, of Woking, and Messrs. T. Allen & Son were the architects.

BRIDLINGTON.—On Saturday the 17th inst., the Yorkshire Foresters' Orphanage and Convalescent Home at Bridlington was opened. The building is arranged for the sub-division of sexes with two day-rooms, matron's-room, dining-room, and kitchen offices on ground floor, and on first floor, six dormitories for forty-six beds, and matron's bedroom, two bath-rooms, and w.c.'s. Two bedrooms are provided in attics for the servants. The walls externally are faced with Lincolnshire red bricks with Howley Park stone dressings, and roofs slated. All the ground floor rooms are laid with wood blocks and corridors, &c., tiled. The internal joinery throughout is selected pitch pine varnished. All rooms have fresh-air inlets and extracting flues in chimney shafts, and are warmed by open fires. The contractors for the work are Messrs. F. Blackburn & Son, of Hull, and the cost about 2,500*l.* The architect is Mr. Robt. J. Beale, of London, whose design was selected in open competition.

INFIRMARY ALTERATIONS, CHELSEA.—At a meeting of the Chelsea Union Guardians on the 20th inst., it was decided that application should be made to the Local Government Board for power to borrow 2,500*l.* for alterations to the bathroom turrets at the infirmary.

WAREHOUSE AND TENEMENTS, PERTH.—A block of tenements with a warehouse on the ground floor has been erected in Market-street, Perth. The front of the building is of red Ballochmyle stone, faced with white corners, &c., from Grange quarries. Above the warehouse are eighteen dwelling-houses, mostly of three rooms, having outside wash-houses and a concrete court about 40 ft. square at the first floor level, with approaches from Milne-street and Market-street. The court is open to the south and east. The work has been executed by the following contractors:—Mason work, Mr. Robert Goodall; joiner and glazier, Mr. David Crichton; plumber work, Messrs. A. & J. Davidson; plaster work, J. Mackay & Son; slater work, James Buchan; clerk of works, David Geekie. The architect was Mr. D. Morison Barker.

UNION OFFICES, ST. OLAVE'S, LONDON, S.E.—The new public offices of the St. Olave's Guardians, erected in Tooley-street, were formally opened on the 21st inst. The offices form the front portion of the building, and are entered from Tooley-street. At the back are the relief station and dispensary, separated from the main building save for a simple means of communication. Upon the ground floor is provided the registrar's private and general office, also offices for the general relieving officer and collector, with porter's box, and the necessary waiting-rooms, &c. Approached by the main central staircase is the first floor, upon which are provided the clerks', general, and private offices, and strong-room, committee-rooms, waiting-rooms, and offices, and at the back the board-room, 50 ft. by 30 ft., with access for reporters, gentlemen's and ladies' retiring-rooms, and back staircase. The second floor and roof will be fitted up as a store for books, stationery, &c., and the basement also as stores and strong-rooms. Passing through the doors at the side of the main stairs, or by the main entrance in Shad Thames, the relief station is entered. In the centre and under the board-room is the large general waiting-room, with two relief committee-rooms, and on each side the rooms for medical and relieving officers. Upon the right is the dispensary and vaccination station, with the consulting-rooms, and over the dispensary the rooms for the caretaker. The exterior of the building is faced with red Dumfries stone dressings, and the roofs are covered with green slates. Mr. J. Bullers, of George-row, Bermondsey, was the contractor, and Mr. Alfred G. Hillier clerk of the works. The architects were Messrs. Newman & Newman, of Tooley-street.

CONSERVATIVE CLUB BUILDING, BARROW.—On the 21st inst. the club building recently erected in Abbey-road, Barrow, were opened. The materials employed in its construction are local brick, faced with Ruabon terra-cotta brick, the entire front of the building being of stone. The main entrance on Abbey-road opens into a vestibule and large entrance hall, from which wide corridors lead to reading-room, smoke-room, billiard-room, bar, and lavatories. The reading-room, which is lighted with lantern roof, may also be used as an assembly hall. The billiard-room is a large building with space for three full-sized tables. Light is obtained from the side street and lantern roof. It is heated with hot-water pipes. From the entrance hall a wide stone staircase leads to the first floor on which are secretary's office and committee-rooms, from which there is access to a balcony. In connexion with the building is a large assembly-room, to be known as the Queen's Hall, capable of seating over 500 people. The main entrance opens from Abbey-road, and to right and left are ladies' and gentlemen's cloak-rooms. Facing the door is a ticket-office, on either side of which wide swing doors open immediately into the hall proper. There is a large end gallery facing the platform or stage, on which some eighty persons may find sitting room. It is a lofty room, lighted by a spacious lantern roof and heated with hot-water pipes. This hall may be made entirely independent of the club premises, and from the platform there is a retiring-room, and below the stage are cloak and dressing rooms, &c., with entrance from High-street. Registration offices, to the right of the club, but quite apart, are entered from Abbey-road. The architect is Mr. J. Y. McIntosh, of Barrow.

CHURCH INSTITUTE, HEXHAM.—The foundation-stones of St. Wilfrid's Abbey Institute were laid on the 22nd inst. The site, which is on Gilesgate Bank, measures 200 ft. by 60 ft. and extends back towards Haugh-lane. The building will have a frontage of 57 ft. with a depth of 100 ft., and will be of red pressed bricks with stone facing. The main entrances will be in Gilesgate, and the ground floor will consist of rector's room, refreshment-room, kitchen, club-room, hall seated for over 200 people, dressing-room, stage and platform, store-rooms, lavatory, and bicycle shed. On the first floor will be the great hall, with platform for concerts; retiring-room, cloak-room, reading-room, conversation-room; and on the attic and gallery floor will be a scullery, caretaker's kitchen, closet stores, bedroom, curates' sitting-room, bedroom and bath. Mr. J. Civil, of Hexham, is the contractor; and Mr. T. G. W. Wilson is clerk of the works. The following are the contractors for the various trades:—Masonry and brickwork, Mr. P. Laing; plastering, Mr. R. Newman; painting and glazing, Mr. Ellis; plumbing and gasfitting, Mr. R. Gibson; slating, Mr. John Charlton. The foundation-stones were worked by Mr. R. Beal, sculptor, Newcastle. The architects were Messrs. Hicks & Charlewood, of Newcastle.

CONSERVATIVE CLUB BUILDINGS, BLACKPOOL.—The new club buildings in Victoria-street, Blackpool, were opened on the 20th inst. The main entrance, which is in Victoria-street, has granite pilasters and carved spandrels, and there is a balcony over it. The entrance-hall is 10 ft. wide, and has tiled dado up to a height of 7 ft. The walnut vestibule doors have lead lights. At the other side is the entrance-hall proper, this being paved with mosaic work. There is a hall-porter's office, and other accommodation, and at the rear of the premises an assembly-room 60 ft. by 27 ft., having a separate entrance and a stage. The ceiling of this is divided into bays, with panelled beams, supported by Ionic corbels. The main staircase, to the right of the entrance-hall, is 5 ft. wide, and is of pitch pine, with elaborately carved walnut newels and handrails. Overlooking Victoria-street are the smoke-room and reading-room, each lighted with two bay windows and a small sitting-room, from which the balcony is approached. The two former rooms are each 29 ft. by 17 ft. Corridors lead to the secretary's and clerk's office and to

private sitting-rooms, and at the end of the second corridor is the catering department. The billiard-room is on the next floor, and is 70 ft. by 28 ft., containing four tables. This room is lighted from arched windows in Victoria-street and from leaded lights in the roof. It has a panelled ceiling with open roof. The card-room, on the same floor, is 30 ft. square. The caretaker's apartments are adjoining and the greater part of the top of the roof of the club has been railed round and so forms a yard. The premises are lighted throughout with electricity. Mr. R. B. Mather was the architect, and Messrs. Cardwell were the general contractors.

## *SANITARY AND ENGINEERING NEWS.*

WATER SUPPLY, CUCKFIELD.—A Local Government Board enquiry was held at Cuckfield on the 20th inst. relative to a proposed loan of 15,000*l.* for the water supply to the parishes of Ardingly, Balcombe, Bolney, Cuckfield Rural, Lindfield, and Slaugham.

THE SANITARY STATE OF BO'NESS.—A report by Mr. John D. Watson, C.E., Aberdeen, who was appointed by the Local Government Board to inquire into the sanitary condition of the burgh, has now been issued. Mr. Watson states that, speaking generally, there is truth in the allegations made under the head of defective drains, traps, gutters, or pipes in the streets of Bo'ness, injurious or prejudicial to health, but undue importance should not be attached to this admission. In dealing with Bo'ness it should be borne in mind that the old part of the town is made up of irregular streets, lanes, and closes of old and often dilapidated houses of the poorest kind. The Local Authority are anxious to remedy the existing defects, and they have during the last two years shown a praiseworthy determination to deal with a large insanitary area by the demolition of houses and by forming new and regular streets on the ground thus set free. At present, sewers and drains are not sufficiently flushed, partially owing to scarcity of water. Under the statute the Local Authority are entitled to sell surplus water after fully supplying what is required for domestic and sanitary purposes; but in this case the Local Authority are reversing the order, inasmuch as they are selling upwards of one million gallons of water per week for trade purposes. Meantime, certain improvements essential under any circumstances, should be effected on the sewerage system in order to render the available supply as efficient as possible. The improvements suggested are stated in detail by Mr. Watson in his report. The question of better scavenging and the provision of an efficient sewerage system for the district might well engage the attention of the Local Authority.

## *FOREIGN.*

FRANCE.—M. Chaplain, M. Roty, and M. Daniel Dupuis have been jointly commissioned by the French Government to study the design for a new postage stamp. M. Chaplain has been commissioned also to design the medal for the awards in connexion with the 1900 Exhibition, and M. Roty to design a tablet or plaque commemorative of the Exhibition.——M. Dalou's bronze group, the Triumph of Silenus, which figured in the Salon of 1897, has been placed in the Luxembourg Garden.——M. Ernest Dubois, the sculptor, has completed the model for the monument to be erected at Meaux to the memory of Bossuet. The monument will comprise a full length figure of Bossuet, with four historic figures of his period grouped around it. It is to be executed in marble.——The Société des Architectes of the Department of the Seine has lost one of its oldest and original members, M. Georges Simon, of Rouen, who has just died, in his eightieth year.——M. Théodore de Foucault, architect, of Marseilles, has died at the age of sixty-two. He had carried out many buildings at Marseilles; among them the Pensionnat des Femmes and the Lunatic Asylum, as well as a mortuary chapel in connexion with the Hôtel Dieu. He was a member of the Jury of Architecture in the Fine Arts School at Marseilles, and also an expert consulting architect to the city authorities.——The death is announced, also at the age of sixty-two, of M. Feine, architect, pupil of Uchard and Lebas, and formerly Inspecteur des Travaux to the Louvre. He built the Casino of Villert-sur-Mer, as well as a large number of villas and châteaux. He was a very active member of the Société Centrale des Architectes.

## *MISCELLANEOUS.*

PROFESSIONAL AND BUSINESS ANNOUNCEMENTS.—Mr. A. P. Florence, 105, Regent-street, has been appointed sole agent for Great Britain for Junker & Ruh's continuous burning anthracite stoves.

CORDELOVA.—We mentioned under "Trade Catalogues" in our issue for July 22 that of the Cordelova Company (Edinburgh), remarking however that, while the style of the designs was good, we had no information as to the nature of the material. The patentees now send us some particulars in regard to it. They state that "Cordelova" is made of paper, and embossed by various processes. One of the characteristics is the extreme lightness and consequent ease in handling, as compared with the high relief of the embossed parts. These latter are so strengthened as to stand any pressure that is likely to be brought to bear upon them. The low relief is made in pieces like wall paper. The high relief is made in suitable lengths or panels. The ceiling panels are usually 2 ft. square, while the friezes, of which there are a large variety, are made in lengths of from 2 ft. 6 in. to over 5 ft. The lightness of the material enables it to be easily hung, and ordinary strong paste is sufficient to attach it to the wall or ceiling. It is usual to paste a strip of thin muslin under the joints, so as to prevent any opening afterwards.

A SELF-PROPELLED FIRE-ENGINE.—The fact that self-propelled fire-engines have not yet found favour in London does not necessarily argue any lack of ability on the part of our manufacturers, and, in fact, Messrs. Merryweather & Sons have just constructed such an engine for use in India. The propelling gear is simple. The pumps are capable of delivering 300 gallons of water per minute, and of throwing a jet to a height of 150 ft. When the fire-engine was tested in London, no difficulty was found in mounting such hills as Blackheath at a speed of ten miles per hour, while on the comparatively level roads over Blackheath to Shooter's Hill, a speed of fifteen to twenty miles per hour was easily maintainable, thus showing that any of the gradients around London could be readily surmounted. The steering-wheel, steam regulating lever, reversing lever and brake, are all within easy reach of a man sitting on the off-side of the front, and an auxiliary brake is provided to work at the back. The machine is arranged to carry the usual complements of firemen, hose, and gear, and the entire weight, when fully equipped with fuel, water, and the firemen, is under three tons. The boiler is of the same pattern as that used in the construction of the engines supplied by this firm to the Metropolitan Fire Brigade. Steam can be raised from cold water to working pressure in six minutes from time of applying a light to the fire; but if a heater with self-locking couplings and automatic disconnexion is fitted in the engine-house, steam can be raised in so short a time that the engine can start at full speed from the fire-station in from three to four minutes from the time of receiving the alarm. When the scene of the fire has been reached the fire pumps can be at once thrown into gear.

ST. MICHAEL'S BASSISHAW.—It is stated that the site of the church, which is about to be demolished in pursuance of a scheme under the Union of Benefices Act, has been bought for 36,000*l.* by the Corporation of the City of London.

RECREATION GROUND, ISLINGTON.—The Islington Vestry have laid out as a public recreation ground for children and a garden the land in Market-road, near Pentonville Prison, which they bought from the Corporation of London. The garden, laid out by the parochial surveyor's department, will shortly be opened to the public.

NEW CLOCK, NEEDWOOD CHURCH.—The church at Needwood (Staffordshire) is about to have a new large clock erected on its tower, which is to show time on two large dials, chime the "Westminster" quarters and strike the hours. Messrs. John Smith & Sons, of Derby, are carrying out the work.

BIRKBECK INSTITUTION.—We have received the Calendar for 1899-1900 of the Birkbeck Literary and Scientific Institution, which, as its title implies, is largely occupied with general education. It includes, however, surveying and mechanics, and instruction in various branches of art study.

EAST COAST DEVELOPMENT.—The East Coast Development Company are making strenuous efforts to popularise the watering-places of Essex and Suffolk. Clacton Pier, nearly 1,300 ft. in length, already has a concert pavilion, and Walton Pier, with its electric railway half a mile in length, will soon have in full working order a pavilion capable of holding about 750 people. The Pier Hotel, which, like the pier, is lighted by electricity, has been recently enlarged and redecorated, and a scheme of further enlargement is being prepared. The company are also erecting in the Round Garden, opposite the railway station and hotel, a floral hall and winter gardens, designed by Mr. C. H. M. Mileham, architect, of London, which will be completed by next season. A contract has been signed with Messrs. A. Fasey & Son, of London, to build a pier at Southwold. This pier is to be 700 ft. long, and its construction is to be sufficiently advanced by next year for the steamers to be able to call on their way to Yarmouth. The work so far is to cost 7,000*l.*, after which a pier head is to be formed, with a concert pavilion. It is intended, moreover, to erect a new hotel, to be called the "Grand," the foundations for which have already been commenced, and a new steamer to be called the *Southwold Belle* is in course of construction by Messrs. William Denny & Brothers, of Dumbarton, to be ready for next season's traffic.—*Daily Graphic.*

LYCH GATE, DOVERCOURT.—A lych gate presented by the Queen, in memory of British soldiers buried in Dovercourt churchyard, was dedicated on the 22nd inst. The gate is of massive oak, and on its front is a suitable inscription, with the Imperial crown, whilst on the side facing the church the royal coat of arms has been carved. The gate was designed by Messrs. J. E. K. & J. P. Cutts, architects, of London, and built by Mr. Edward Saunders, of Dovercourt.

BRITISH FIRE PREVENTION COMMITTEE.—The arrangements of the British Fire Prevention Committee for the winter session will again include a comprehensive series of fire tests, to which it has also been decided to invite distinguished guests from abroad, the almost international interest accorded to the work having led to a number of applications from foreign officials, architects, and engineers to attend the experiments. In October there will be further investigations with doors of various materials, with floors, patented partitions, and non-flammable materials. The operations of the testing station will then probably be extended to experiments with automatic fire-alarms. It would be well to remind would-be members that election after October 1 of this year will not necessitate a fresh subscription for the coming year; but that, on the other hand, an entrance fee will be shortly instituted in addition to the annual one guinea subscription. Membership will henceforward also give the right to the provisions of the reports of the testing station beyond the ordinary publication of the committee. Special arrangements have been made by which Local Authorities can take up membership if represented by an individual member or official, and several Local Authorities have already availed themselves of this facility. The secretary, Mr. G. E. Monckton, who was obliged to temporarily relinquish his duties in February last through ill-health, has now been able to return to his post.

PUBLIC IMPROVEMENTS, BIRKENHEAD.—Colonel W. Langton Coke conducted a Local Government Board inquiry at the Birkenhead Town Hall on the 22nd inst. in respect of the Corporation's application to borrow 5,000*l.* for the purpose of supplying electricity to the outlying townships of Bidston and Noctorum, 2,000*l.* for technical instruction purposes, and 330*l.* for purchasing property for street improvement. The 5,000*l.* was asked for in consequence of a request from inhabitants of the townships named. The 2,000*l.* is needed to provide a chemical laboratory at the Holt Science and Art School, to extend the main building, and to erect a plumbers' and metal-workers' shop. The 330*l.* is required for the purchase of half a dozen insanitary dwellings in Egerton-street. The houses will be demolished and the thoroughfare improved.

STAFFORDSHIRE BUILDING TRADE.—The building trade throughout the district continues in a most flourishing condition, and there is a general demand for most classes of operatives. Bricklayers report employment as plentiful, with none unemployed. Carpenters and joiners are working overtime in a number of shops. Masons and plasterers are regularly employed. Plumbers and painters are moderately busy. In all the brick and tile yards there is great activity. At Leek all branches are moderately busy, the best off being joiners. At Crewe employment is very good, there being no operatives in any branch out of work.—*Staffordshire Sentinel.*

EXCAVATIONS AT MELANDRA CASTLE.—Mr. John Garstang, who has been superintending the excavations carried on at Melandra Castle, has submitted an interim report to the committee who have the work in hand. The excavations, the report states, have so far determined the nature and positions of the corner turrets of the Roman fort, the eastern entrance with its guard-chambers, a greater part of the pretorium, or some group of buildings of importance, and the position of the western entrance. With the exception of a series of drains eight yards apart, the ground lies apparently undisturbed, in some cases the walls being found immediately below the sod. The easterly entrance proves to be well preserved in detail, some of its masonry being exceptionally good. An interesting point suggested at the present stage is the possibility of this entrance having been surmounted by two unequal arches, the larger for road traffic, the smaller for foot passengers; which form, though not unknown in the south—as at Lincoln—is apparently only met with in the northern forts at that known as Hardknott Castle, and in some of the smaller Roman forts in northern Africa. For the present, the trend of the street crossing the interior in front of the pretorium seems to confirm the impression conveyed by the results of excavation; but possibly the central "spina" will be found better preserved in one of the other chief entrances. The rampart surrounding the enclosure is a feature of great archæological interest, and apparently of a unique type. So far as present results warrant an opinion, it seems to have had, near the gates and corners at least, an outer faced wall, backed up with rubble, against which local marl was piled to a considerable height—standing now in places from 4 ft. to 6 ft.—whilst a row of flat stones placed vertically, 40 ft. within the outer wall, may possibly have been designed to assist the alignment and construction. This differs essentially from the stout, double-faced wall, strengthened sometimes by an earthwork, that usually enclosed such a station. In the interior there is little accumulation or disturbance, and the walls of three rooms and a large court, with other indications of what was probably the pretorium, have been found well preserved. It is in the interior of such chambers that small images and inscriptions to the Emperor are usually met with; whilst in the same vicinity might be some altar or carving, not carried away at the

time of evacuation. With the acquiescence of the committee, and at the recommendation of Mr. Haverfield, the whole of the interior of this pretorium will be uncovered with a view to these possibilities. An endeavour is also projected to locate the position of the Roman burial ground, which should yield inscriptions and other interesting memorials.—*Manchester Courier.*

ALL SAINTS' CHURCH, LAMBETH.—By reason of the extension of the London and South Western Railway terminus this church will be speedily demolished. It was built after Rogers' designs in 1846-7, and twenty years later the chancel was refitted and rearranged by Withers. The marble reredos ranks among the finest in South London.

MEMORIAL WINDOW, PARISH CHURCH, POLLOKSHIELDS, N.B. — A stained-glass window has been placed in this church in memory of the late Mr. J. Y. King. The window was from the studio of Mr. Stephen Adam, of Glasgow.

## *CAPITAL AND LABOUR.*

END OF THE BRICKLAYERS' LABOURERS' STRIKE, LEICESTER.—Sir William Markby, the arbitrator appointed by the Board of Trade, has delivered his award in reference to the protracted dispute between the master builders of Leicester and the bricklayers' labourers. It will be remembered that in November last the Builders' Labourers' Society and the General Labourers' Union applied on behalf of the labourers for an advance of 1d. per hour in the wages, and thereby raising it from 6d. to 7d. But they afterwards intimated their readiness to accept ½d. This was refused, and 800 labourers struck work to enforce the demand, at the beginning of April. Since then, the employers have offered the men ¼d., but this was refused. The arbitrator awarded the labourers the desired 6½d. per hour. He also decided that the employers should reinstate all their old workmen at as early a date as possible, and that these should not interfere with the men now employed, except by using legal means to induce them to join the union.

## *LEGAL.*

### HOW SHOULD A CIRCULAR-SAW GUARD BE SET?

AT Marylebone County Court on Monday, before Judge Stonor and a jury, Rodney Pridden, a builder's machinist, twenty-one years of age, living at 204, Carlton Vale, Kilburn, London, W., claimed damages under the Employers' Liability Act from Messrs. Godson & Sons, builders, contractors, and timber merchants, Pembroke Works, Kilburn-lane, London, W., in respect to personal injuries sustained while in the defendants' employ. Mr. Moyses was counsel for the plaintiff, and Mr. Clavel Salter, counsel, defended.

The plaintiff stated that he had been engaged by the defendants to assist in working a circular saw. This machine had a guard which had to be set in a line with the saw, and, when rightly set, there was but little danger of those working the machine getting their hands too near the teeth of the saw. On February 24 last he was assisting in cutting a piece of timber 13 ft. long and 12 in. square. A man named Seagar, who had charge of the machine, and whose orders he had to obey, had set the guard. When the timber had been cut a few feet it was found that the guard was not quite in a line with the saw. Seeing this, Seagar shouted to him (plaintiff) to place the guard in a proper position. Although the saw was still revolving, he went to carry out Seagar's instructions, but had barely touched the guard when the teeth caught his hand. Two of the fingers were frightfully "jagged"; the second finger had to be amputated, and the first was now perfectly stiff. He had not been able to do any work since the accident.

The Judge: Was it your place to stop the saw when the guard required shifting?

The plaintiff: No, it was Seagar's duty to stop the saw.

William Cecil Moore, another employé at defendants' works, corroborated as to Seagar instructing the plaintiff to shift the guard.

Mr. William Pether, an engineer, called as an expert, maintained that the guard should be set by means of a straight-edge, and not—as was admitted to have been done by Seagar—by simply looking sideways to see that it was in line with the saw.

In cross-examination, this witness said that it was an act of madness on the part of the plaintiff to place his hand anywhere near the saw while the machine was in motion.

For the defence, Thomas Frederick Hunt, foreman at the defendants' mills, stated that Seagar was merely a fellow-workman with the plaintiff, over whom he had no superintendence whatever. If the plaintiff required to shift the guard, he should first have stopped the machine.

Cross examined. The plaintiff was getting 4½d. an hour at the time of the accident, while Seagar received 7½d. an hour.

Alfred George Seagar said that when he called out to the plaintiff to shift the guard he intended him first to stop the machine. He was in charge of the same machine when a man named Poulson met with a similar accident.

The jury found (1) that Seagar did order the plaintiff to shift the guard; (2) that Seagar was guilty of negligence in giving such order; (3) that the plaintiff was not guilty of contributory negligence; and they assessed damages at 100*l.* His Honour gave judgment accordingly, and allowed costs.

### "RUSHING UP" A BUILDING.

THE case of Ward, Lock, & Co., Limited, *v.* The Gas Light and Coke Company, Limited, again came before Mr. Justice Darling, sitting as Vacation Judge, on the 27th inst., on an application by the plaintiff company for an interim injunction to restrain the defendant company until the trial from heightening their premises so as to obstruct the plaintiff's ancient lights. The case was before the learned Judge on the 20th inst.—reported in the *Builder* of last week—but was ordered to stand over for a week on the defendants giving an undertaking to suspend their building operations to the roof and top floor meanwhile.

Upon the case being reached, Mr. Alexander, Q.C., for the plaintiffs, said that negotiations were going on between the parties with a view to the settlement of the dispute, and, in all probability, his lordship would not be troubled with it. In these circumstances it was proposed, with his lordship's sanction, that the motion should stand over for another week on the same undertaking by the defendants as before.

The application was granted.

### APPLICATION TO RESTRAIN ERECTION OF BUILDINGS.

THE case of the Gresham-street Warehouse Company, Limited, *v.* Braid, Pater, & Company, Limited, came before Mr. Justice Darling, sitting as Vacation Judge, on the 27th inst., on a motion by the plaintiff company for an interim injunction to restrain the defendant company from erecting certain buildings.

Upon the case being called on, counsel for the plaintiff company said it had been agreed between the parties that the motion should be treated as the trial of the action, and, on the order agreed upon, the defendants undertook to do certain work and to pay the costs of the action.

His Lordship assented to the order as agreed upon.

### BUILDING IN CONTRAVENTION OF PLANS.

THE case of Leveson-Gower *v.* Sewell came before Mr. Justice Darling, sitting as Vacation Judge on the 27th instant, on an application by the plaintiff for an interim injunction to restrain the defendant from building not in accordance with plans.

When the case was reached, Mr. Mulligan, Q.C., for the plaintiff, in support of the motion, said that the learned counsel for the defendant desired time to answer affidavits, and it had been arranged that the case should stand over till next Wednesday.

The application was granted.

## MEETINGS.

FRIDAY, SEPTEMBER 29.

*Sanitary Institute (Lectures for Sanitary Officers).*—Mr. John Castell-Evans on "Meteorology." 8 p.m.

SATURDAY, SEPTEMBER 30.

*London and Provincial Builders' Foremen's Association (Memorial Hall Farringdon-street).*—Monthly meeting. 7.30 p.m.

MONDAY, OCTOBER 2.

*Sanitary Institute (Lectures for Sanitary Officers).*—Mr. Edward F. Willoughby on "Elementary Statistics." 8 p.m.

*Society of Engineers.*—Mr. J. Bridges Lee on "Photographic Surveying." 7.30 p.m.

WEDNESDAY, OCTOBER 4.

*Sanitary Institute (Lectures for Sanitary Officers).*—Mr. Herbert Manley on "Sanitary Law: English, Scotch, and Irish; General Enactments, Public Health Act, 1875; Model By-laws, &c." 8 p.m.

*Builders' Foremen and Clerks of Works' Institution.*—Ordinary meeting of the members. 8 p.m.

FRIDAY, OCTOBER 6.

*Sanitary Institute (Lectures for Sanitary Officers).*—Mr. F. J. Waldo, on "Public Health Statutes; Orders, Memoranda, and Model By-laws of the Local Government Board, and By-laws in Force in the Administrative County of London." 8 p.m.

SATURDAY, OCTOBER 7.

*Sanitary Institute (Demonstrations for Sanitary Officers)*—Inspection and Demonstration at Wimbledon Sewage Works. 3 p.m.

*British Institute of Certified Carpenters.*—Meeting at Carpenters' Hall. 6 p.m.

## RECENT PATENTS:

ACCEPTED SPECIFICATIONS.

*Open to Opposition until November 20.*

[1898]. 19,202, Glover, Machinery (with Safe-guards) for Sawing, Splitting, and Screening Wood. 19,276, Morris & Spraggett, Combined Oil and Acetylene Lamp. 19,518, Marshall, Acetylene Lamps. 19,610, Jones & Eaton-Shore, Multiple Tool-holder. 19,636, Blackburn & Spence, Distribution of Electricity on the Three-Wire Current System. 20,957, Haigh, Machine for Recessing and Mortising Window Stiles. 23,179, Davis, Lead-lined or Lead-coated Pipes and Tubes. 23,247, Gamson, Door Fastener. 23,671, Streitz, Sifting, Sorting, or Separating Machines. 23,698, Mommertz, Mine Ventilation Tubes. 23,729, Tyzack & Holmes, Tape Measures. 23,812, Cloutier (*alias* Cloutier-Colson), Pipe Joints and Connexions. 24,065, Margulies, Generation of Acetylene Gas: see also [1899] 14,984 and 15,506. 24,109, Berry, Wood Block Parquetry and Similar Flooring. 24,115, Schmidlin, Electricity Meter. 24,265, Hirst, Filaments for Incandescence or Glow Electrical Lamps. 24,532, Soc. Français des Câbles Electriques, Système Berthoud, Borel et Cie., Electrical Cables for High Tension Currents. 24,669, Watkin, Aneroid Barometers. 25,209, Pilous, Ottermann & Nauheim, Method of Producing Gas from Town Refuse and Sweepings, and Apparatus for the Same. 25,771, Elworthy & Lane, Production of Lighting, Heating, and Power Gas. 26,738, Taylor, Conduit Inspection Fittings for Electrical Wiring. 26,969, Quandt & Schelbeck, Dies for Cutting Screw Threads. 27,571, Bengough, Apparatus for Fastening and Securing Scaffold Poles Together for Buildings, Temporary Stands, Structures, Bridges, &c. [1899] 7,200, Geisseler, Acetylene Gas Burner. 8,515, Rowley, Hydraulic or Pneumatic Accumulator. 8,945, Jones, Water Wheels. 9,165, Hermann, Theodolites, or Range-finders. 9,171, Julyan, Anti-fouling Compositions or Paints. 9,575, Waldthausen, Guide and Support for Boring Tool in Appliances for Boring Angular Holes. 11,557, Weichelt, Turbines. 12,486, McChesney & Mackintosh, Wrenches. 12,780, Lehmann, Incandescent Spirit Lamps. 13,813, Lechien & Bastin, Ventilating Fans, &c. 13,826, Tobiansky, Elastic and Permeable Electrodes for Storage Batteries. 13,883, Tomlinson & Phillips, Reversible Windows. 13,893, Timmler, Annealing Furnaces. 14,592, Bumb, Magnesium Alloys. 14,984, Bridges, Production and Storage of Acetylene and other Gases. 14,985, Delafield, Measuring Faucets. 15,506, Dolan, Packing Calcium Carbide, and Generation of Acetylene Gas. 15,749, Dunlap, Stop Cocks or Valves. 15,889, Wangelin, Closing Devices for the Valves of Water Cisterns, &c. 15,907, Simon, Inlaying Metal Corner-pieces in Window Frames, &c. 16,071, Schweizer, Keys for Locks. 16,088, Lohmann, Device for Securing Doors or French Windows, &c., in an Opened Position. 16,366, Burke, Toothed Armature Plates. 16,387, Short, Brush Holders for Electrical Machines. 16,439, Toerring, Arc Lamps. 16,627, Lesthevenon, Electrical Arc Lamps.

ABSTRACTS OF PATENTED INVENTIONS.

11,726.—JAWS FOR LATHE CHUCKS OR FACE PLATES: *E. Ekerdt & C. Zell.*—These are made in two parts joined together by a bayonet-joint; the one part has gripping surfaces to be readily turned on the other part, and its two curved surfaces bear against segments on the other part.

11,741.—LADDERS: *F. J. Carter.*—To the upper part of the ladder are hooked two stays, whose bottom lengths are telescopical to be secured in position with pins that pass through holes in their upper and lower lengths, the stays have steel points that fit into eyes when the ladder is not being used.

11,743.—ATMOSPHERICAL OIL BURNERS: *J. H. Woodroffe & J. W. B. Wright.*—To prevent the flashing of a flame to the non-burning or vapourising side of the wick is provided an extension attached to or formed with the wick-tube.

11,570.—DISINFECTANT COVERING FOR WALLS, FLOORS, &c.: *J. Willocks.*—With a natural or artificial pigment, clay, or earth, *e.g.*, whiting, is incorporated a disinfectant, deodorant, or similar active substance, *e.g.*, carbolic acid; the product may be used as a coating, covering, lining, or material of construction for walls, floors, ceilings, and similar parts of buildings, or it may be moulded into mantel ornaments and other shapes; it can be moulded also into building and similar blocks, or for deposit in sinks and urinals, and can be made in a more or less fluid form to serve as the body of a wash or paint.

11,814.—SUPPLY OF LIQUID DISINFECTANT: *J. Evetts & F. C. Schurz.*—To effect a uniform supply the closed reservoir has an inner chamber, open at the bottom, and having a screwed stopper at the top; the liquid disinfectant is conveyed by a wick in a tube between the chamber and a mass of absorbent material laid in a trough underneath the reservoir, whence it evaporates into the air; a drip spout, communicating with a water-closet, urinal, &c., carries off the excess of liquid.

11,837.—STONE-SAWING AND SAWS: *C. E. Loesche & B. P. Zschunke.*—The saws are made of bars or of twisted +, T, or I-sections, or of two wires twisted together; their surfaces or edges may be fitted with diamonds or other hard substance, and their grooves may be filled with emery mixed with baked or air hardened cementing material; for sawing stone into any shape desired, templets or guides upon the table act upon vertically-guided blocks which are dotted in order to receive the reciprocating saw-frame, the stone being fed by a counterweight; the movement of the guiding-blocks is checked by either frictional brakes or hydraulic cylinders.

11,860.—CIRCUIT-BREAKER FOR USE AS A BURGLAR-ALARM, &c.: *A. W. Sauerbrey.*—The principle of the invention is that, when all the contacts are made, the currents which flow through the two magnet coils of the relay are equal, and no movement of the armature occurs, but the armature will be moved and a signalling device be worked if the contact is broken; the special contact-breaker includes a carbon cylinder hanging from the conductor, and normally resting against the contact screw; if the appliance is meddled with or shaken, the swinging cylinder breaks and makes contact.

11,862.—GRATINGS FOR DRAIN TRAPS: *A. & G. W. Beldam.*—Brackets, carrying pivots, are bolted on to the opposite sides of the frame, the pivots being made to project through holes in the frame and into holes in the grating, whilst slots may be formed in the frame for engagement with pins upon the grating, the grating-bars are fashioned of various shapes and dispositions in order to ensure a breaking-up of the water—some of them may be straight, and others may be corrugated in a horizontal plane.

11,910.—ACETYLENE LAMPS: *J. Bartlett.*—A pipe, perforated to allow passage of water into the carbide chamber, joins two cone-shaped water chambers. A screwed cap on the carbide chamber receives the gas reservoir, which has a burner and an upper chamber packed with wadding, tow, or other material that filters the gas.

11,919.—FRAMES FOR SKYLIGHTS, DORMER WINDOWS, &c.: *H. Flesche.*—The frames are made by stamping metal sheets or plates between dies; the side wall is then cut through to separate a part which is adapted for a sash to hold the glass pane, and its upper edge is pressed inwards, so that the frame may fit over it. To the separated part or sash a central strengthening bar is rivetted, and

# COMPETITIONS, CONTRACTS, AND PUBLIC APPOINTMENTS.

## CONTRACTS.

| Nature of Work or Materials. | By whom Required. | Forms of Tender, &c. Supplied by | Tenders to be delivered. |
|---|---|---|---|
| *Supply of Flints | Hampton Wick U.D.C. | .... .. | Oct. 2 |
| *Hire of Road Roller.. | Wimbledon U.D.C. .. | Surveyor, Council Offices, Broadway, Wimbledon.. | do. |
| *Kerbing and Tarpaving, Tremilhan-road, Brockley | Lewisham B. of W. .. | Surv.'s Dept. Lewisham Town Hall, Catford, S.E. | Oct. 3 |
| *Kerbing and Tarpaving Silvermere-road, Catford | do. | do. | do. |
| *Kerbing and Tarraving part of Davenport-road, Catford | do. | do. | do. |
| Stable and House, Cleckheaton .... | North Bierley Joint Hospital Bd. | G. C. Ross, 41, Manville-terrace, Bradford | do. |
| Workhouse Offices | Armagh Union | W. Calvert, Guardian's Offices, Armagh | do. |
| Granite (500 tons) | Quarry Bank U D.C... | A. Homfray, Council Offices, Cradley Heath .. | do. |
| Refuse Destructor Buildings, Foss Islands Depot | York Corp. | A. Greer, City Engr. Guildhall, York | do. |
| Sewering Low Spring-road, &c. | Keighley Corp. | W. H. Hopkinson, C.E. Town Hall | do. |
| Alterations, &c. Three Crowns Hotel, Sunderland | R. Fenwick & Co. Ltd. | G. G. Hoskiss, Archt. Darlington | do. |
| Drainage Works, Tower-street | Bantry (Ireland) R.D.C. | R. Croly, Workhouse, Bantry | do. |
| Main Sewers, Hale, Cheshire | Bucklow R.D.C. | J. M'D. M'Kenzie, Surv. 7, Market-st. Altrincham.. | do. |
| Sewerage Works, Kilworth North.... | Lutterworth R.D.C... | J. C. Coates, Surv. Bittes-well, nr. Lutterworth . | do. |
| Shop, Jackson's-row | Manchester Corp. .... | City Surv. Town Hall .... | do. |
| Cottage, Burnham Beeches Station .. | G. W. Ry. Co. | G. K. Mills, Paddington Station, W. | do. |
| *Construction of Sewers, &c. | Alton U.D.C. | Surv. Council Offices, Alton, Hants | Oct. 4 |
| *Supply of Glazed Stoneware Pipes and Pieces | do. | do. | do. |
| Road Improvement Works, Wainhouse-road | Halifax Corp. | E. K. S. Escott, C.E. Town Hall | do. |
| Station Buildings, Tollerton | N. E. Ry. Co. | W. Bell, Archt. Railway Station, York | do. |
| Alterations, &c. to Premises, Boulevard, Weston-super-Mare.... | .... | H. F. Price, Archt. Waterloo-st. Weston-super-Mare .. | do. |
| Four Cottages at Sewage Disposal Works | Hampton (Middlesex) U.D.C. | J. Kemp, C.E. Hampton | do. |
| School, Parson's Green | Edinburgh Sch. Bd. .. | R. Wilson, Archt. 3, Queen-st. Edinburgh | do. |
| Flints, Gravel, &c. | Weybridge U.D.C.... | J. S. Crawshaw, Surv. Council Offices, Weybridge | do. |
| *Erection of Infectious Diseases Hospital | City of Sheffield | Flockton, Gibbs, & Flock-ton, 15, St. James-row, Sheffield | Oct. 5 |
| New Streets, Dunston | Wickham (Durham) U.D.C. | E. E. Clephan, Archt. St. Nicholas-chmbrs. Newcastle-on-Tyne | do. |
| Rebuilding Black Bull Inn, Market Place | J. Tetley & Son, Ltd. | F. W. Ridgway, Archt. Bond-st. Dewsbury | do. |
| Alterations, &c. to Electric Light Works | Hastings Corp. | P. H. Palmer, C.E. Town Hall | do. |
| High Chimney Shaft near Brede Bridge | do. | do. | do. |
| S hools, Minworth, nr. Birmingham | Lea Marston Sch. Bd. | F. Towler, 185, Vauxhall-rd. Birmingham | do. |
| Additions to Factory, Northallerton | ..... | J. M. Bottomley, Archt 28, Albert-rd. Middlesbrough | do. |
| *Laying-out and Formation of Streets, &c. | Folkestone Co-op. Soc. Ltd. | A. H. Steele, Surv. Folke-stone-rd. Dover | do. |
| Coastguard Station, Laytown, co. Meath | ..... | H. Williams, Office of Public Works, Dublin .. | do. |
| *Erection of House, &c. | Midland Railway .... | Co.'s Archt. Cavendish House, Derby | Oct. 6 |
| Alterations to Station, Worksop .... | Great Central Ry. Co. | O. S. Holt, London-road Station, Manchester .... | do. |
| Additions to Schools, Trerobert, Ynysybwl | Llanwonno Sch. Bd... | A. O. Evans, Archt. Pontypridd | do. |
| Four Cottages, Leixlip, Ireland | Celbridge R D.C. .... | L. A. McDonnell, Archt. 33, Kildare-st. Dublin | do. |
| Widening Two Bridges, Mill Green, Hatfield | Herts C.C. | U. A. Smith, Surv. 41, Parliament-st. S.W. .... | Oct. 7 |
| Additions, &c. to No. 7A, North-st. Horsham | ..... | C. H. Burstow, Archt. 6, West-st. Horsham | do. |
| Additions to Hospital, Ravenshouse-road | Dewsbury Corp. | G. T. Lee, Town Hall .... | do. |
| Waterworks | Bridgwater R.D.C. .. | W. J. Press, C.E. Town Hall, Burnham, Somt... | do. |
| Branch Library, Roath | Cardiff Corp. | Teather & Wilson, Archt. Queen-st. Cardiff | do. |
| Three Houses, Dog-lane, Stainland .. | ..... | C. F. L. Horsfall & Sons, Archt. Lord-st. Chmbrs. Halifax | do. |
| *Cleaning and Painting the Main Water Tank .. | Parish of St. Leonard, Shoreditch | Master at Workhouse, 213, Kingsland-rd. N.E. .... | Oct. 9 |
| *Works and Materials | Hendon U.D.C. | S. S. Grimley, Council Offices, Hend n, N.W. .. | do. |
| Workhouse Extension | Burnley Union | S. Keighley, Archt. Nicholas-st. Burnley.... | do. |
| Storage Tank, &c. at Public Baths .. | Birkenhead Corp. .... | C. Brownridge, C.E. Town Hall | do. |
| Residence, Crook, co. Durham | Primitive Methodist Soc. | F. H. Livesey, Archt. Bishop Auckland.. | do. |
| Offices, Fire Station, &c. Stratford-rd. Sparkhill | Yardley R.D.C. | A. Harrison, Archt. 88, Colmore-row, Birmingham | do. |
| Reservoir, Moorhouses | Teignmouth Corp.... | J. Mansergh, Engr. 5, Victoria-st. S.W. | do. |
| Sewers, &c. | St. Marychurch (Devon) U.D.C. | R. H. Worth, C.E. 42, George-st. Plymouth.. | do. |
| Road Works, Oole-rd. | Cleethorpes U.D.C. .. | E. Rushton, C.E. Poplar-rd. Cleethorpes | Oct. 10 |

## CONTRACTS—*Continued.*

| Nature of Work or Materials. | By whom Required. | Forms of Tender, &c. Supplied by | Tenders to be delivered. |
|---|---|---|---|
| Additions to Hospital, Ystrad | Rhondda U.D.C. .... | W. D Morgan, Archt. 23, St. Mary-st. Cardiff .... | Oct. 10 |
| Bridewell and Offices, Chancery-st Dublin | Office of Public Works (Dublin) | H. Williams, at the Office, Dublin | do. |
| *Supplying and Fixing Wrought-iron Principals, &c. | Walthamstow U.D.C | Works Manager, Priory-avenue, Hoe-st. Station, Walthamstow | Oct. 11 |
| Parochial Offices | Devonport Union .... | H. G. Luff, Archt. 64, Chapel-st. Devonport.... | do. |
| School, Bishop Sutton, nr. Bristol.... | ..... | M. Froud, Archt. 1, St. Stephens-st. Bristol .... | do. |
| Boiler House, &c. Cross Mill, Elland.. | ..... | W. C. Williams, Archt. 29, Southgate, Halifax..... | do. |
| *Making-up and Paving Streets | Vestry of Fulham .... | C. Botterill, Town Hall, Walham Green, S.W. .. | do. |
| *Making Entries into Sewers | Greenwich B. of W. .. | Offices, 141, Greenwich-rd. Greenwich | do. |
| *Pulling-down, &c. | ..... | Carter & Ashworth, 86, Eden-st. Kingston-on-Thames | Oct. 12 |
| School | South Normanton S.B. | R C. & E. R. Sutton, Archt. Bromley House, Nottingham | do. |
| Workhouse | Wolverhampton Union | A. Marshall, Archt. King-st. Nottingham | do. |
| Pipe Sewers (7,800 yards) nr. Prescot, Lancs. | Whiston R.D.C. | J. T. Wood, C.E. 3, Cook-st. Liverpool | do. |
| *Erection of the Downshall School | Ilford Sch. Bd. | C. J. Dawson, 7, Bank-bldgs. Ilford | do. |
| Church, St. Joseph's, Skerton, Lancaster | ..... | Rev. P. O'Bryen, Slyne-rd. Skerton | Oct. 13 |
| *Erection of School | Watford Sch. Bd. .... | W. H. Syme, 4, High-st. Watford, Herts. | Oct. 14 |
| *Erection of Police Station | Cnty. of Gloucester .. | Vale & Kingsford, Barton-st. Gloucester | do. |
| Additions to School, Bootham, York | ..... | W. H. Thorpe, Archt. 61, Albion-st. Leeds | do. |
| *Erection of Workmen's Dwellings.... | Wimbledon U D.C. .. | C. H. Cooper, Council Offices, Broadway, Wimbledon | Oct. 16 |
| *Building Six Class-rooms at Gascoigne-road School, Barking | Barking Sch. Bd. .... | C. J. Dawson, East-street, Barking | do. |
| *Enlargement of Storing Reservoir, &c. | Corp. of Gt. Farrington | B. Latham, 13, Victoria-st. Westminster | do. |
| *Erection of Mortuary at Infirmary, Isleworth | Brentford Union | W. H. Ward, Paradise-st. Birmingham | Oct. 18 |
| *Erection of Workhouse | do. | do. | do. |
| Road Works, Hexthorpe | Balby-with-Hexthorpe U.D.C. | G. Gledhill, Surv. High-rd. Balby | do. |
| Gritt Setts (6,500 tons) | Little Hulton (Lancs.) U.D.C. | C. C. Hooley, C.E. 34, Brazennose-street, Manchester | Oct. 23 |
| *Erection and Completion of Isolation Wards, &c. | Romford Joint Hosp Bd. | Whitmore, 17, Duke-st. Chelmsford | Oct. 24 |
| *Erection of New Female Staff Home, &c. | St. George's Union .. | E. T. Hall, 57, Moorgate-st. E.C. | Nov. 7 |
| Sewerage Works, Darton, Yorks. | ..... | W. H. Radford, C.E. Angel-row, Nottingham | Nov. 10 |
| *Laying a Main Sewer | ..... | C. E. Vaughan, 11, Adam-st. Strand, W.C. | No date |
| Several Small Houses, Ashton-under-Lyne | ..... | S. Lomas, 5, Stockport-rd. Ashton-under-Lyne | do. |
| Business Premises, off Park-crescent, Barry, Glam. | W. J. Rogers, Ltd. .. | Jones, Richards & Budgen, Archt. 18, St. Mary-st. Cardiff | do. |
| Six Houses, Bexley Heath, Kent .... | ..... | Hawkins & Edgecombe, Archt. 22, Henrietta-st. W.C. | do. |
| Warehouse, &c. Holme Bank, Rawtenstall | ..... | J. Taylor, 6, Ormerod-st. Rawtenstall | do. |
| Rebuilding Grove Inn, Elland-road, Brighouse | ..... | J. Lane Fox, Bond-street, Dewsbury | do. |
| Stabling, Red Lion Inn, Wyke, Yorks. | ..... | do. | do. |
| Steam Laundry, Blackburn | ..... | Stones & Stones, Archt. 10, Richmond-terrace, Blackburn | do. |
| Business Premises, No. 71, High-st. Stockton | ..... | T. W. T. Richardson, Archt. 57, High-st. Stockton.... | do. |
| Inn, North Shields | Tyne Improvement Commrs. | W. H. Knowles, Archt. 37, Grainger-st. Newcastle .. | do. |

## PUBLIC APPOINTMENTS.

| Nature of Appointment. | By whom Advertised. | Salary. | Application to be in. |
|---|---|---|---|
| *Architectural Surveyor and Draughtsman | L.C.C | 3l. 3s. per week | Oct. 6 |
| *Storekeeper | Tottenham U.D.C. .. | 35s. per week | Oct. 7 |
| *Engineering Draughtsman and Architectural Draughtsman | City of Nottingham .. | 150l. per annum and 100l. per annum | Oct. 9 |
| *Clerk of Works | Tottenham U.D.C... | 2l. 10s. per week | Oct. 11 |
| *Engineering Assistant | City of Birmingham.. | 120l. per annum | Oct. 12 |
| *Borough Engineer and Surveyor | Cnty. Boro of Walsall | 400l. per annum | Oct. 14 |
| *Architectural Draughtsman and Engineering Assistant | Cty. Boro of Croydon | 150l per annum and 130l. per annum | Oct. 16 |

*Those marked with an asterisk (*) are advertised in this Number.* *Competitions, p. —.* *Contracts, pp. iv. vi. viii. x. & xxi.* *Public Appointments, pp. xix. & xxi.*

has an eye at one end for attachment of the stay rod. To the sash and frame are rivetted lugs, through which passes a hinge pin or bolt, secured with a fly-nut. The frame's side edges may be bent over, and a swelling may be stamped in the top of the plate. Then openings are cut in the sash, and the panes are fixed.

11,929.—BEAM COMPASSES: *A. J. Bull.*—A guide-bar, of equilateral or triangular section, on which slides a block fixed with a fine adjustment screw, is fitted to the clamp of the adjustable leg of the compasses.

12,031.—LIFTING JACKS: *C. E. Schmidt.*—Each jack has two racks whereby the load can be raised to twice the usual height; if the load is light the racks may be worked at the same time, whilst the one rack is being lifted the casing rests upon a block to which the other rack is attached, the casing is then lifted on to that other rack; both racks are moved by means of one crank-handle, the gear wheels having slip keys which enable them to run loosely upon their spindles.

12,038.—DISTEMPERS AND WASHES: *T. Cardiff.*—Quicklime is treated with a solution of crystallised sugar, and the resultant liquid is added to whiting, strained, and allowed to settle, then equal parts of the lime and whiting residues are mixed with the liquid until it assumes the consistency of an ordinary colour wash or paint, dry colours being added to produce such shades as may be desired.

12,062.—PAPER-HANGINGS: *W. Yates.*—The inventor's object is to enable wall paper to be trimmed without the use of shears, to which end its edges are perforated or slit by an apparatus affixed to the printing machine; the cutter may consist of a toothed wheel working in conjunction with either a pair of discs pressed by springs or a grooved wheel; for long slits is employed a plane cutting disc notched at intervals, provision is made for adjustment of the discs upon their shafts and for a vertical and lengthwise adjustment of the shafts, a roller upon one of the shafts between the cutters supports the paper's entire breadth.

12,100.—HINGE OR PIVOT FOR SWING DOORS: *R. Hodges & F. J. H. Lilley.*—The closing spring of the pivot or hinge is contained in a box sunk within the floor, one end of the compressor spring presses against the abutment plate, which can be adjusted sideways by means of a screw, whereby two swing doors are brought into alignment, the spring forces a plate against a crank or cam on the pivot of the door, and an oblong piece upon the pivot's top fits into a recess in the shoe which is fastened on to the door.

12,149.—ROOFS AND SIMILAR STRUCTURAL WORK: *E. L. Pease.*—The invention concerns roofs, &c., constructed of slotted tubular rafters, after the kind specified in No. 10,637 of 1894, joined together with curved metal sheets, and braced with struts and ties. The rafters may be joined either at the ridge or by horizontal slotted tubes bolted on to struts. The edges of the curved metal sheets are flanged or joined to angle-iron strips that fit in the slotted tubes, whilst wooden or metallic stretchers are inserted between the tubes for purposes of stiffening. For roofs of wide span the spaces between the overlapping ends of the rafters and sheets will serve for ventilation purposes; for smaller roofs the rafters are joined together at the ridge and also to short horizontal slotted tubes by means of bent U-shaped metal strips; or their upper ends are joined to horizontal tie-rods by vertical struts or boards.

12,159.—DRAWING TABLES: *C. A. Hirth.*—Four bars, joined by cross-bars, form a jointed parallelogram, a standard carrying the rod upon which two adjacent bars are pivotted; other bars carry the table for the drawing board, the table being counter-weighted; the straight-edge hangs from cords over pulleys, and is counter-balanced by weights upon cords over smaller pulleys, or its weight may be balanced by means of a spring drum attachment and clamp.

12,179.—DRAIN TESTING: *R. G. L. Burn.*—An inflatable plug used in stopping drains for testing purposes, has metal ends joined by a central tube to which is affixed an india-rubber tube; excessive inflation is prevented by means of a canvas cover, whose ends are gathered together and sewn to bands attached to discs by cords that are tightened into grooves in the disc-rims; the plug is drawn into its place with cords or chains.

12,219.—STONEMASON'S CHISELS, &C.: *H. Smith.*—Reversable and renewable blades are formed so as to present parallel grooves on either side to receive projections

upon the tool handle, the blade being driven sideways into its position; the blades described may be cut off from a rolled bar having a section the same as that of the blade.

## SOME RECENT SALES OF PROPERTY:

### ESTATE EXCHANGE REPORT.

September 13.—By GERMAN & GERMAN (at Ashby-de-la-Zouch).

Church Gresley, Derby.—A freehold house and three messuages ..... £1,190
Three freehold building sites ..... 934
Overseal, Leicester.—Three freehold closes, 14 a. 2 r. ..... 820
Two freehold messuages ..... 265
Ashby-de-la-Zouch, Leicester.—A freehold house and 11 a. 3 r. 37 p. ..... 1,300
Various enclosures, 24 a. 2 r. 28 p., f. ..... 2,440
A freehold nursery, 6 a. 3 r. 17 p. ..... 1,000
Three freehold fields, 6 a. 2 r. 17 p. ..... 480
Shelbrook, Leicester.—Three freehold fields, 4 a. 1 r. 9 p. ..... 212
Heather, Leicester.—A freehold farm, 38 a. 1 r. 2 p. 1,750
Donisthorpe, Leicester.—A freehold field, 1 a. 3 r. 30 p. ..... 123
Packington, Leicester.—Ivy House and cottages, f. 600
Castle Donington, Leicester.—A freehold close, 1 a. 2 r. 21 p. ..... 175
A house and brickyard works, 8 a. 3 r. 38 p., f. 1,020
Wilson, Leicester.—A freehold messuage ..... 120
Griffydam, Leicester.—A house and two messuages, f. ..... 300

September 18.—By A. SAVILL & SON.

West Ham.—60, 62, and 64, Church-st., and 3 to 8, Vaughan's-pl., and an enclosure of land, area 6,000 ft., f. ..... 2,000

September 19.—By BROAD & WILTSHIRE.

Walworth.—72 and 76, Mann-st., u.t. 52 yrs., g.r. 13*l.* 13s. ..... 565

By H. DONALDSON & SON.

City-rd.—23, City Garden-row, u.t. 28 yrs., g.r. 5*l.* 210

By BATCHELAR & SON (at Croydon).

Croydon.—73, Coombe-rd., f., r. 80*l.* ..... 1,300
Coombe-rd., a plot of building land, f. ..... 250
20 to 44 (even), Dryden-rd., u.t. 98 yrs., g.r. 50*l.* 1,800

By Messrs. COBB (at Rochester).

Hoo St. Werburgh, Kent.—Three freehold cottages ..... 250
Market garden land, 1 a. 3 r. 26 p., f. ..... 120
Chatham, Kent.—Polly Wood, 13 a. 1 r. 13 p., f. 200

September 20.—By H. J. BROMLEY.

Catford.—52, Faversham-rd., f., e.r. 30*l.* ..... 335

By Messrs. SPELMAN (at Norwich).

Norwich.—Thorpe-rd., Ridgewell House and 0 a. 1 r. 33 p., f. ..... 1,675
Lower Clarence-rd., two building sites, f. ..... 460
58, Prince of Wales-rd., f. ..... 810

By TABERNACLE & SON (at "Horseshoe Hotel").

Camden Town.—Pratt-st., "The Golden Lion" p.h., u.t. 76 yrs., r. 120*l.*, with goodwill ..... 25,050

September 21.—By B. R. BOSTOCK.

West Kensington.—38 and 46, Dewhurst-rd., u.t. 81½ yrs., g.r. 13*l.*, r. 84*l.* ..... 985
Plaistow.—20 and 22, Anne-st., f. ..... 500

*Contractions used in these lists.*—F.g.r. for freehold ground-rent; l.g.r. for leasehold ground-rent; i.g.r. for improved ground-rent; g.r. for ground-rent; r. for rent; f. for freehold; c. for copyhold; l. for leasehold; e.r. for estimated rental; u.t. for unexpired term; p.a. for per annum; yrs. for years; st. for street; rd. for road; sq. for square; pl. for place; ter. for terrace; cres. for crescent; yd. for yard, &c.

## PRICES CURRENT OF MATERIALS:

### WOOD.*

Per Petersburg standard hundred.

| | £ | s. | d. | £ | s. | d. |
|---|---|---|---|---|---|---|
| White Sea: first yellow deals | 17 | 5 | 0 | 18 | 5 | 0 |
| Second do. | 13 | 10 | 0 | 15 | 0 | 0 |
| Third do. | 11 | 15 | 0 | 13 | 0 | 0 |
| Battens, 40s., 30s., and 15s. less respectively. | | | | | | |
| Petersburg: first yellow deals | 14 | 0 | 0 | 16 | 10 | 0 |
| Second do. | 11 | 0 | 0 | 12 | 10 | 0 |
| Battens, 30s. and 20s. less respectively. | | | | | | |
| Petersburg, white deals | 10 | 0 | 0 | 12 | 0 | 0 |
| Do. white battens | 8 | 15 | 0 | 10 | 5 | 0 |
| Riga, white deals | 8 | 10 | 0 | 9 | 10 | 0 |
| Swedish mixed yellow deals | 13 | 10 | 0 | 17 | 0 | 0 |
| Third do. | 12 | 10 | 0 | 15 | 0 | 0 |
| Fourth do. | 11 | 0 | 0 | 12 | 0 | 0 |
| Fifth do. | 10 | 0 | 0 | 11 | 0 | 0 |
| Battens, 30s., 20s., and 10s. less respectively. | | | | | | |
| Whitewood, 10 to 20 per cent. less. | | | | | | |
| Finnish unsorted yellow deals | 10 | 0 | 0 | 10 | 10 | 0 |
| Battens, 10s. and 5s. less respectively. | | | | | | |
| Whitewood, 5 to 10 per cent. less. | | | | | | |
| Norwegian second yellow battens | 7 | 10 | 0 | 8 | 0 | 0 |
| Third do. | 7 | 0 | 0 | 7 | 10 | 0 |
| Fourth do. | 6 | 10 | 0 | 7 | 0 | 0 |
| Whitewood, 10s. less. | | | | | | |
| Danzig, Crown Deck deals, per 40 ft. 3 in. | | | | | | |
| Brack | 0 | 15 | 0 | 1 | 5 | 0 |
| St. Lawrence Pine deals, &c., per P.S.H.: | 0 | 12 | 0 | 1 | 0 | 0 |
| 1st, Bright and Dry, regular sizes | 20 | 15 | 0 | 27 | 5 | 0 |
| 2nd " oddments | 13 | 15 | 0 | 20 | 10 | 0 |
| " " regular sizes | 15 | 15 | 0 | 19 | 0 | 0 |
| 3rd " oddments | 11 | 5 | 0 | 14 | 15 | 0 |
| " " regular sizes | 9 | 15 | 0 | 11 | 5 | 0 |
| 4th " oddments | 8 | 5 | 0 | 9 | 5 | 0 |
| " " regular sizes | 8 | 0 | 0 | 8 | 15 | 0 |
| " " oddments | 7 | 5 | 0 | 8 | 0 | 0 |
| St. Lawrence Spruce deals, &c. | | | | | | |
| First, regular sizes | 9 | 0 | 0 | 11 | 0 | 0 |
| Second " | 7 | 15 | 0 | 8 | 15 | 0 |
| Third " | 7 | 10 | 0 | 8 | 5 | 0 |
| Fourth " | 6 | 10 | 0 | 7 | 5 | 0 |

* The prices named are for the wood as imported and landed in the docks. Ten per cent., approximately, should be added in order to arrive at the current trade prices

### PRICES CURRENT—*continued.*

| | £ | s. | d. | £ | s. | d. |
|---|---|---|---|---|---|---|
| Oddments and battens at 20s., 10s., 7s. 6d., and 5s. less respectively. | | | | | | |
| New Brunswick Spruce deals, &c. | 7 | 10 | 0 | 8 | 5 | 0 |
| Oddments, battens, and fourths | 6 | 15 | 0 | 7 | 15 | 0 |
| United States pitch pine planks and boards | 8 | 15 | 0 | 12 | 5 | 0 |
| Prepared Boards, per square | | | | | | |
| 1¼ by 6½ and 7 in. 1st yellow | | 11 | 0 | | 15 | 6 |
| " " 2nd " | | 7 | 0 | | 11 | 3 |
| 1 by 6½ and 7 in. 1st " | | 10 | 3 | | 11 | 9 |
| " " " white | | 8 | 0 | | 10 | 3 |
| " " 2nd yellow | | 8 | 0 | | 10 | 3 |
| " " " white | | 6 | 3 | | 8 | 0 |
| ¾ by 6½ & 7 in. 1st & 2nd yellow | | 7 | 9 | | 8 | 9 |
| " " " white | | 7 | 0 | | 8 | 3 |
| ¾ by 6½ and 7 in. 1st yellow and white (grooved, tongued, and beaded) | | 7 | 9 | | 8 | 6 |
| ¾ by 6½ and 7 in. 2nd yellow and white (ditto) | | 7 | 3 | | 8 | 0 |
| ⅝ by 6½ and 7 in. 1st yellow and white (ditto) | | 5 | 9 | | 6 | 9 |
| ⅝ by 6½ and 7 in. 2nd yellow and white (ditto) | | 4 | 9 | | 5 | 9 |
| Narrower widths at 10 per cent. less. | | | | | | |
| 3rd quality at 15 per cent. less than 2nd. | | | | | | |
| Danzig and Memel Fir Timber— per load | | | | | | |
| Best middling | 3 | 0 | 0 | 3 | 5 | 0 |
| Good middling and Second | 2 | 10 | 0 | 3 | 0 | 0 |
| Common middling | 2 | 5 | 0 | 2 | 10 | 0 |
| Undersized | 2 | 5 | 0 | 2 | 15 | 0 |
| Swedish and Norwegian Balks | 2 | 5 | 0 | 2 | 10 | 0 |
| Baltic Oak Timber— | | | | | | |
| Danzig and Stettin—Large | 3 | 0 | 0 | 3 | 10 | 0 |
| Small | 1 | 15 | 0 | 2 | 0 | 0 |
| Quebec Timber per load | | | | | | |
| Yellow Pine | 5 | 0 | 0 | 6 | 15 | 0 |
| Oak | 4 | 2 | 6 | 6 | 0 | 0 |
| Elm | 4 | 12 | 6 | 5 | 5 | 0 |
| Ash | 3 | 15 | 0 | 4 | 15 | 0 |
| Birch | 2 | 12 | 6 | 4 | 10 | 0 |
| New Brunswick, &c., Birch | 1 | 10 | 0 | 2 | 2 | 6 |
| American Pitch Pine Timber | 3 | 7 | 6 | 3 | 17 | 6 |
| Wainscot, per log, 18 cubic ft.— | | | | | | |
| Crown (Eng. & Dutch) } nominal | 3 | 17 | 6 | 5 | 10 | 0 |
| Brack } nominal | 3 | 2 | 6 | 4 | 2 | 6 |
| Lathwood, per cubic fathom— | | | | | | |
| Petersburg | 4 | 0 | 0 | 6 | 10 | 0 |
| Riga and Danzig | 4 | 10 | 0 | 5 | 10 | 0 |
| Norway Poles, per ft. run | 0 | 0 | 1 | 0 | 0 | 1½ |
| Oak Staves, per mille full size pipe | | | | | | |
| Memel, Crown | 210 | 0 | 0 | 220 | 0 | 0 |
| Brack | 180 | 0 | 0 | 190 | 0 | 0 |
| Danzig | 165 | 0 | 0 | 175 | 0 | 0 |
| Bosnia, single Barrel (nominal) | 28 | 0 | 0 | 30 | 0 | 0 |
| United States, Pipe | 35 | 0 | 0 | 42 | 10 | 0 |
| Hogshead, extra heavy and double extra | 27 | 10 | 0 | 32 | 10 | 0 |
| Indian Teake per load | 11 | 10 | 0 | 16 | 10 | 0 |
| British Guiana Greenheart | 0 | 0 | 0 | 8 | 0 | 0 |
| Mahogany, per foot superficial— | | | | | | |
| Honduras, cargo average | 0 | 0 | 4½ | 0 | 0 | 6 |
| Nicaragua, do. | 0 | 0 | 4½ | 0 | 0 | 5½ |
| Tabasco, do. | 0 | 0 | 4 | 0 | 0 | 6½ |
| Mexican, do. | 0 | 0 | 3½ | 0 | 0 | 4 |
| Panama, do. | 0 | 0 | 3 | 0 | 0 | 4 |
| African, do. | 0 | 0 | 3½ | 0 | 0 | 5 |
| Cuba, do. | 0 | 0 | 5½ | 0 | 0 | 7½ |
| St. Domingo, do. | 0 | 0 | 5 | 0 | 0 | 7 |
| Do. Curls (good to prime) | 0 | 0 | 9 | 0 | 1 | 3 |
| Walnut, American (logs) | 0 | 2 | 3 | 0 | 4 | 6 |
| Do. do. (planks and boards) | 0 | 2 | 0 | 0 | 7 | 6 |
| Italian, per foot superficial | 0 | 0 | 3 | 0 | 0 | 7½ |
| Black Sea, per ton | 6 | 0 | 0 | 12 | 0 | 0 |
| Satin Walnut (logs) per foot cube | 0 | 1 | 0 | 0 | 1 | 3 |
| " (planks and boards) | 0 | 2 | 0 | 0 | 2 | 9 |
| Sequoia (Californian redwood), per foot cube | 0 | 1 | 9 | 0 | 2 | 0 |
| Whitewood, American (logs) | 0 | 1 | 3 | 0 | 1 | 6 |
| " " (planks and boards) | 0 | 1 | 6 | 0 | 2 | 9 |
| Quartered oak " " | 0 | 2 | 3 | 0 | 4 | 0 |
| Kauri pine (logs) | 0 | 1 | 9 | 0 | 2 | 0 |
| " " (planks) | 0 | 2 | 3 | 0 | 2 | 9 |
| Jarrah (planks) | 0 | 2 | 3 | 0 | 2 | 6 |
| Lancewood spars each, fresh and large | 0 | 5 | 0 | 0 | 8 | 0 |
| Lancewood spars, ordinary to fair | 0 | 4 | 0 | 0 | 5 | 0 |
| Degame spars | 0 | 8 | 0 | 0 | 10 | 6 |

### METALS.

| | | | | | | |
|---|---|---|---|---|---|---|
| IRON—Pig, in Scotland ton | 3 | 10 | 1½ | 0 | 0 | 0 |
| Bar, Welsh, in London | 6 | 0 | 0 | 6 | 5 | 0 |
| Do. do. at works in Wales | 5 | 15 | 0 | 5 | 17 | 6 |
| Do. Staffordshire, in London | 6 | 5 | 0 | 7 | 10 | 0 |
| COPPER—British cake and ingot | 80 | 5 | 0 | 80 | 15 | 0 |
| Best selected | 81 | 5 | 0 | 82 | 0 | 0 |
| Sheets, strong | 86 | 0 | 0 | 88 | 0 | 0 |
| Chili bars | 76 | 7 | 6 | 0 | 0 | 0 |
| YELLOW METAL lb. | | 6½d. | | | 7¼d. | |
| LEAD—Pig | | | | | | |
| Spanish ton | 15 | 10 | 0 | 0 | 0 | 0 |
| English Com. Brands | 15 | 15 | 0 | 0 | 0 | 0 |
| Sheet, English, 6 lbs. per sq. ft. and upwards | 16 | 15 | 0 | 0 | 0 | 0 |
| Pipe | 17 | 5 | 0 | 0 | 0 | 0 |
| ZINC—English sheet ton | 27 | 0 | 0 | 0 | 0 | 0 |
| Vieille Montagne | 28 | 0 | 0 | 0 | 0 | 0 |
| Spelter | 21 | 10 | 0 | 22 | 0 | 0 |
| TIN—Straits | 149 | 5 | 0 | 0 | 0 | 0 |
| Australian | 149 | 5 | 0 | 149 | 15 | 0 |
| English Ingots | 152 | 10 | 0 | 153 | 10 | 0 |
| Banca | 0 | 0 | 0 | 0 | 0 | 0 |
| Billiton | 0 | 0 | 0 | 0 | 0 | 0 |

### OILS.

| | | | | | | |
|---|---|---|---|---|---|---|
| Linseed ton | 22 | 2 | 6 | 0 | 0 | 0 |
| Cocoanut, Cochin | 29 | 5 | 0 | 0 | 0 | 0 |
| Do. Ceylon | 25 | 15 | 0 | 0 | 0 | 0 |
| Palm, Lagos | 24 | 0 | 0 | 0 | 0 | 0 |
| Rapeseed, English, pale | 25 | 0 | 0 | 0 | 0 | 0 |
| Do. Brown | 23 | 10 | 0 | 0 | 0 | 0 |
| Cottonseed ref. | 17 | 15 | 0 | 18 | 15 | 0 |
| Oleine | 17 | 5 | 0 | 19 | 0 | 0 |
| Lubricating U.S. | 0 | 5 | 9 | 0 | 7 | 9 |
| Do. Black | 0 | 5 | 0 | 0 | 6 | 0 |
| TAR—Stockholm barrel | 1 | 6 | 6 | 0 | 0 | 0 |
| Archangel | 1 | 0 | 0 | 0 | 0 | 0 |
| Turpentine | 37 | 5 | 0 | 0 | 0 | 0 |

## TO CORRESPONDENTS.

M. & F. Amounts should have been stated).

NOTE.—The responsibility of signed articles, letters, and papers read at public meetings, rests, of course, with the authors.

*We cannot undertake to return rejected communications.*

Letters or communications (beyond mere news items) which have been duplicated for other journals are NOT DESIRED.

We are compelled to decline pointing out books and giving addresses.

Any commission to a contributor to write an article is given subject to the approval of the article, when written, by the Editor, who retains the right to reject it if unsatisfactory. The receipt by the author of a proof of an article in type does not necessarily imply its acceptance.

All communications regarding literary and artistic matters should be addressed to THE EDITOR; those relating to advertisements and other exclusively business matters should be addressed to THE PUBLISHER, and *not* to the Editor.

## TENDERS.

[Communications for insertion under this heading should be addressed to "The Editor," and must reach us *not later than 10 a.m. on Thursdays.* N.B.—We cannot publish Tenders unless authenticated either by the architect or the building-owner; and we cannot publish announcements of Tenders accepted unless the amount of the Tender is given, nor any list in which the lowest Tender is under £100, unless in some exceptional cases and for special reasons.]

* Denotes *accepted.* † Denotes *provisionally accepted.*

BAKEWELL (Derbyshire).—For the erection of Infirmary, &c., at workhouse, for the Union Guardians. Mr. E. M. Longdon, architect, Town Hall, Bakewell. Quantities by architect:—

Geo. Knowles, Matlock ..... £6,492
Cox, Wilson, & Sons, Ashford, Bakewell* 6,167

BIRMINGHAM.—For the erection of casual wards at the workhouse, Selly Oak, for the King's Norton Guardians. Messrs. C. Whitwell & Son, architects, 23, Temple-row, Birmingham. Quantities by Mr. T. H. Mansell:—

| | | | |
|---|---|---|---|
| Hunt Bros. | £6,438 | F. Nicholls | £5,712 |
| Fincher & Co. | 6,400 | Harley & Sons | 5,597 |
| Moffat & Sons | 6,250 | T. W. Halward | 5,567 |
| Beach & Co. | 6,000 | W. S. Seamark | 5,555 |
| E. J. Charles | 5,991 | R. M. Hughes | 5,492 |
| Freeman & Sons | 5,989 | W. Bishop | 5,477 |
| Bowen & Sons | 5,840 | Whitehouse & Sons, Birmingham* | 5,469 |
| T. Loud | 5,795 | | |
| W. H. Gibbs | 5,787 | | |

BOSTON (Lincs.).—For the execution of street works, Sydney-street, for the Urban District Council. Mr. W. H. Wheeler, C.E., Borough Offices, Boston:—

Wm. Greenfield, Union-place, Boston* .. £200 10

BRISTOL.—For re-building a factory, Fairfax-street, for Messrs. Paunall & Sons, Ltd. Mr. William Paul, architect, Wells-road, Bristol. Quantities by the architect:—

| | | | |
|---|---|---|---|
| C. A. Hayes | £3,343 | Wilkins & Gosling | £2,869 |
| Wm. Church | 3,169 | R. F. Ridd* | 2,825 |
| Cowlin & Son | 3,164 | | |

BURES ST. MARY (Suffolk).—For the erection of a malt kiln. Mr. C. J. Hair, Bugle-street, Southampton, and Mr. G. H. Page, Trinity-chambers, Colchester, joint architects. Quantities by Mr. J. F. Crook, 39, Cambridge-road, Southampton:—

| | | | |
|---|---|---|---|
| E. West | £1,150 | Grimwood & Sons | £1,099 |
| F. Dupont | 1,137 | | |

DEVONPORT.—For the erection of five blocks of buildings for artisans' dwellings for the Town Council. Mr. J. F. Burns, Borough Surveyor, 30, Ker-street, Devonport:—

| | | | |
|---|---|---|---|
| T. King | £11,375 11 | Wakeham Bros. | £8,354 0 |
| R. G. Jenkins | 8,990 0 | Goad & Co. | 8,297 0 |
| C. & W. C. Rowell | 8,950 0 | H. E. Skinner | 8,202 0 |
| T. May | 8,628 0 | Lethbridge & Son | 7,998 0 |
| A. N. Coles | 8,500 0 | S. Roberts, Plymouth* | 7,994 8 |

DROGHEDA (Ireland).—For laying footways (10,000 yards superficial), for the Corporation. Mr. Nicholas Hatch, C.E., Borough Surveyor:—

| | Per square yard. s. | d. |
|---|---|---|
| B. McDonnell | 4 | 6 |
| W. H. Mills | 4 | 6 |
| Christopher Gogerty | 3 | 9 |
| Beckett & Co. | 3 | 6 |
| Rome & Co. | 3 | 6 |
| Walker & Son, Leeds* | 3 | 5 |

GRAYS.—For alterations for the Capital and Counties Bank, Limited. Mr. Chistopher M. Shiner, architect, 3, Bond-court, Walbrook, E.C.:—

| | | | |
|---|---|---|---|
| Davey Bros. | £1,930 | H. R. Rous | £1,750 |
| Potter | 1,800 | J. Brown | 1,655 |

GREENWICH.—For the erection of offices, &c., for the Directors of the East Greenwich Mutual Benefit Building Society. Mr. Alfred Roberts, architect, 18, Nelson-street, Greenwich, S.E.:—

| | | | |
|---|---|---|---|
| F. J. Gorham | £1,450 | Henry Bridel | £1,280 |
| Hayter & Son | 1,375 | F. P. Smith | 1,274 |
| W. Mills | 1,363 | E. Mills* | 1,191 |
| Jones & Groves | 1,339 | | |

LEICESTER.—For erection of new schools, Narborough-road, Leicester, for the Free Christian Church. Mr. Chas. Kempson, architect. Quantities by the architect:—

| | | | |
|---|---|---|---|
| Herbert & Son | £1,298 | H. Bland | £1,145 |
| Bentley & Co. | 1,206 | Bradshaw Bros. | 1,134 |
| W. Haddon | 1,205 | W. Jayes | 1,099 |
| J. R. Tebbatt | 1,168 | F. Elliott* | 1,163 |
| F. J. Rudkin | 1,146 | | |

[*See also next page.*

LEICESTER.—For the erection of a house near Leicester for Mrs. Turner and Miss Pettifor. Mr. Edward Turner, architect, Bank-buildings, Leicester :—

| | | | |
|---|---|---|---|
| Johnson & Son | £1,308 10 0 | J. Pipes | £1,205 0 0 |
| Bentley & Co. | 1,225 0 0 | F. E. Elliott.. | 1,193 0 0 |
| T. Herbert .. | 1,224 4 6 | G. Holt* .... | 1,124 0 0 |

LONDON.—For shop front, &c., at the West Ham Brewery, Romford-road, Forest Gate, E., for Mr. R. W. Reeve. Mr. Fred. A. Ashton, architect, 177, Romford-road, Stratford, E. :—

| | | | |
|---|---|---|---|
| I. & H. Cocks..... | £1,149 | A. E. Symes‡ ..... | £1,125 |
| G. J. Hosking..... | 1,139 | | |

‡ Accepted subject to modification.

MANCHESTER.—For taking down existing buildings known as Gleden Hall, and erecting upon the site twenty dwellings in Gleden-street and Hayle-street, Ancoats, Manchester, for the trustees of the late Miss Eliza Porter. Messrs. C. K. & T. C. Mayor, architects, 41, John Dalton-street, Manchester :—

A. R. Bullivant & Sons, Moston-lane, Blackley ..... £2,800

NEW TUPTON (Derbyshire).—For the erection of Church Institute, Sunday-school and caretaker's house, for the Rev. J. L. Blake. Mr. Ernest Oxley, architect, Clay Cross :—

Davenport & Madin, accepted on a schedule of prices.

SUNBURY-ON-THAMES.—For the supply of granite and flints, for the Urban District Council. Mr. H. F. Coales, Surveyor, Council Offices, Sunbury :—

*Guernsey Granite.*

| | s. d. | |
|---|---|---|
| Mowlem & Co., Westminster*.. | 14 7 | per ton at Station. |
| Do. do. .. | 13 4 | ,, at Wharf. |

*Flints.*

| | |
|---|---|
| Wills & Packham, Ltd., Sittingbourne* ..... | 6 10 per yard at Wharf. |

[Tenders by schedule.]

TRURO.—For the construction of c. i. water mains, for the Rural District Council. Mr. R. Hansford Worth, C.E., 42, George-street, Plymouth. Quantities by engineer :—

| | | | |
|---|---|---|---|
| J. Thaddock.. | £6,923 7 3 | W. C. Thaddock ..... | £5,841 0 0 |
| E. Duke..... | 6,319 13 0 | R. J. Thomas. | 5,831 0 0 |
| R. H. B. Neal | 6,090 0 0 | Hooper Bros. & Roberts, St. Agnes*.. | 5,743 11 10 |
| H. E. Skinner ..... | 6,076 16 3 | A. Delbridge . | 5,700 0 0 |
| Hawking & Best ..... | 5,953 5 10 | | |

TUNBRIDGE WELLS.—For the erection of first portion of parish room and institute, St. John's. Messrs. H. H. & E. Cronk, architects, Mount Ephraim-road, Tunbridge Wells. Quantities by architects :—

| | | | |
|---|---|---|---|
| G. Hudson..... | £3,692 | Strange & Sons .... | £3,113 |
| Turner & Co. ..... | 3,449 | Crates & Son ..... | 2,970 |
| J. Jarvis..... | 3,380 | Bowman & Sons, Stamford* ..... | 2,900 |
| Padgett & Son..... | 3,293 | | |
| Davis & Leaney .... | 3,239 | | |

WEST WINCH (Norfolk).—For additions, &c., to National School buildings, for the Managers. Mr. A. J. Lacey, architect, 6, Upper King-street, Norwich :—

| | | | |
|---|---|---|---|
| J. W. Collins ..... | £310 0 | Read & Co. ..... | £275 0 |
| W. H. Brown .... | 307 0 | Hill & Horsley, Lynn* ..... | 244 7 |
| Bardell Bros..... | 305 0 | | |

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BATH.
FOR ALL THE PROVED KINDS OF
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FLUATE, for Hardening, Waterproofing, and Preserving Building Materials.

**HAM HILL STONE.**
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The Ham Hill and Doulting Stone Co.
(incorporating The Ham Hill Stone Co. and C. Trask & Son The Doulting Stone Co.)
Chief Office :—Norton, Stoke-under-Ham, Somerset.
London Agent :—Mr. E. A. Williams, 16, Craven-street, Strand.

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THE TEST OF TIME
has proved that
**SZERELMEY STONE LIQUID**
Absolutely waterproofs and preserves Bricks, Stone, Cement, Stucco, Plaster, &c.
**SZERELMEY & CO.,**
ROTHERHITHE NEW-ROAD, S.E.

**SPRAGUE & CO., Ltd.,**
Sole Agents for
THE "E.R.A." PHOTO. BLOCK CO.
4 & 5, East Harding-street, Fetter-lane, E.C. [ADVT.

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**SLATER and TILER.**
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To be executed by Contract in any part of ENGLAND.
Penrhyn - Bangor,
Oakeley - Portmadoc,
And other description of Slates Ready for immediate delivery to any Railway Station.
Applications for Prices, &c., to
BETHNAL GREEN SLATE WORKS,
BETHNAL GREEN, LONDON, E.

**ASPHALTE**
For Horizontal & Vertical Damp Courses.
For Flat Roofs, Basements, & other Floors.
Special attention is given to the above by
THE
**French Asphalte Co.**
Contractors to
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For estimates, quotations, and all information, apply at the Offices of the Company,
**5, LAURENCE POUNTNEY HILL,**
CANNON STREET, E.C.

**C. B. N. SNEWIN**
MAHOGANY, WAINSCOT, WALNUT,
TEAK, VENEER, and TIMBER MERCHANT,
Nos. 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, & 17, BACK HILL, HATTON GARDEN, and 29, RAY STREET, FARRINGDON ROAD, E.C.
THE LARGEST STOCK OF ALL KINDS OF WOODS IN EVERY THICKNESS, DRY, AND FIT FOR IMMEDIATE USE.
Telephone, No. 274 Holborn. Tele. Address "SNEWIN: London."

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## F. BRABY & CO.
**VERY PROMPT SUPPLY.**
**LARGE STOCK READY.**
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LIVERPOOL: 6 and 8, HATTON GARDEN.
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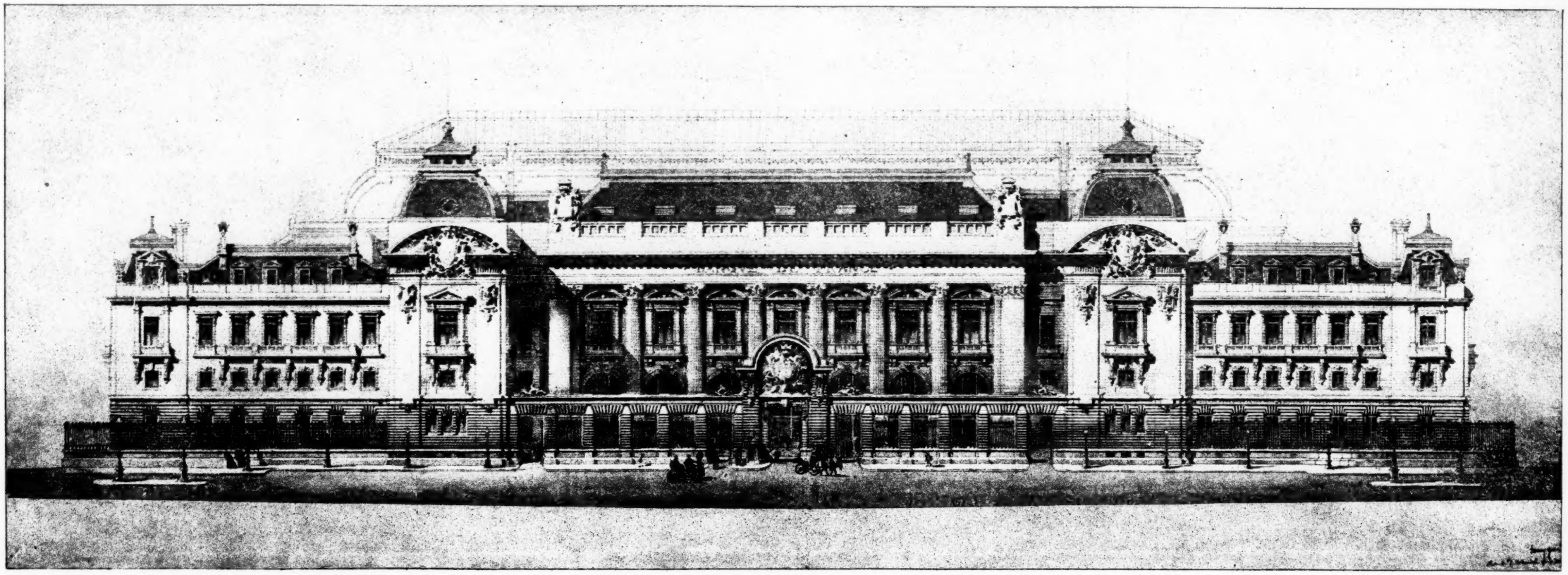
BRISTOL: ASHTON GATE WORKS, CORONATION-RD.



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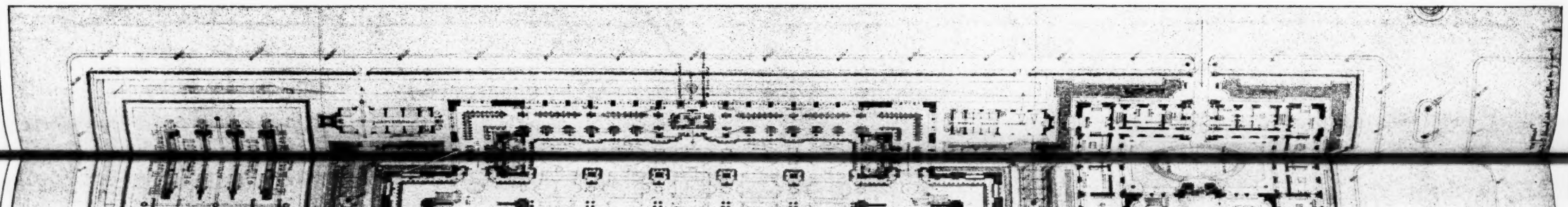

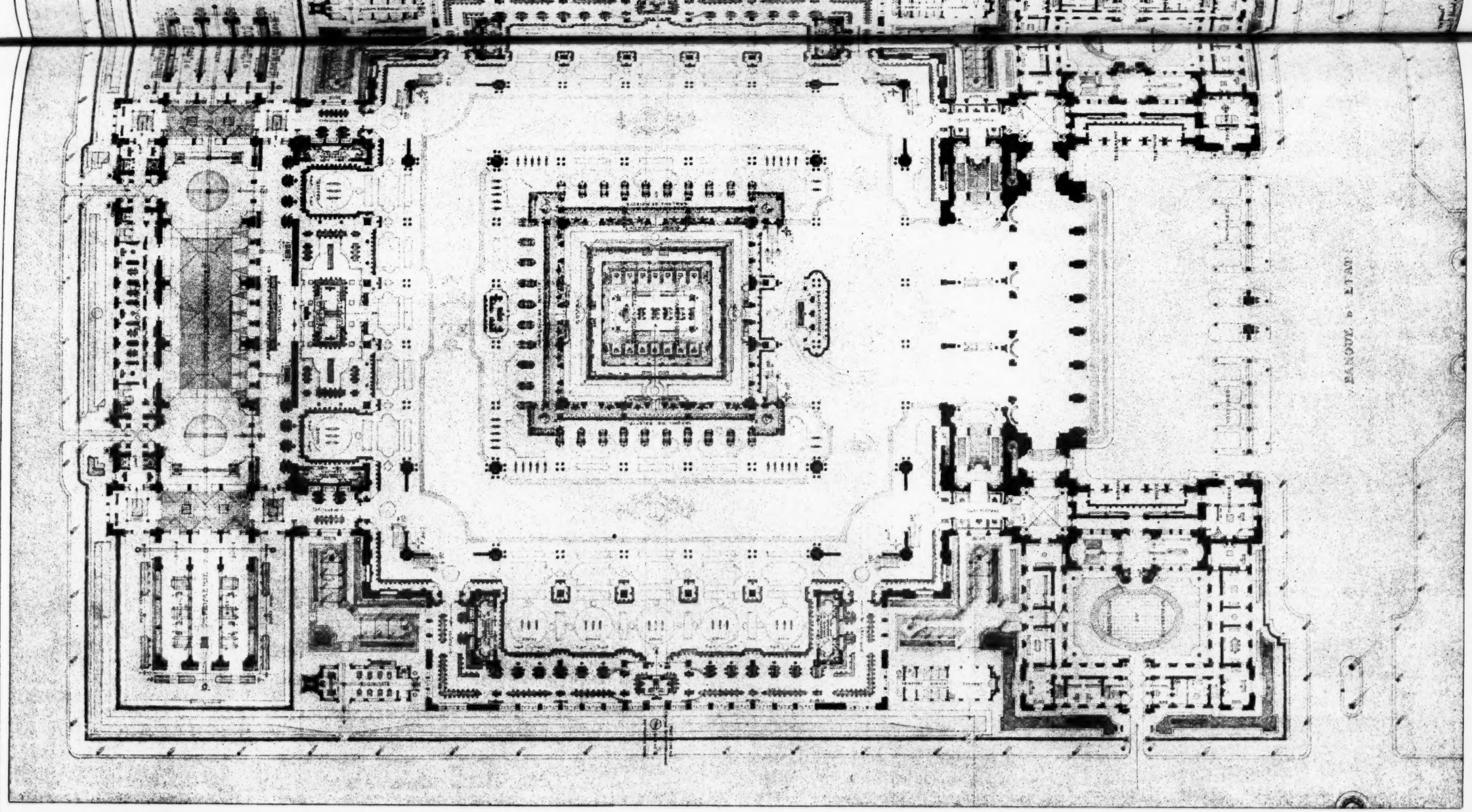

GROUND PLAN.

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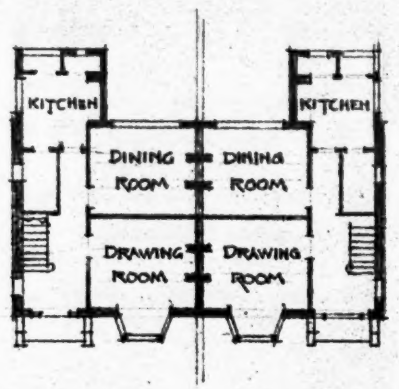
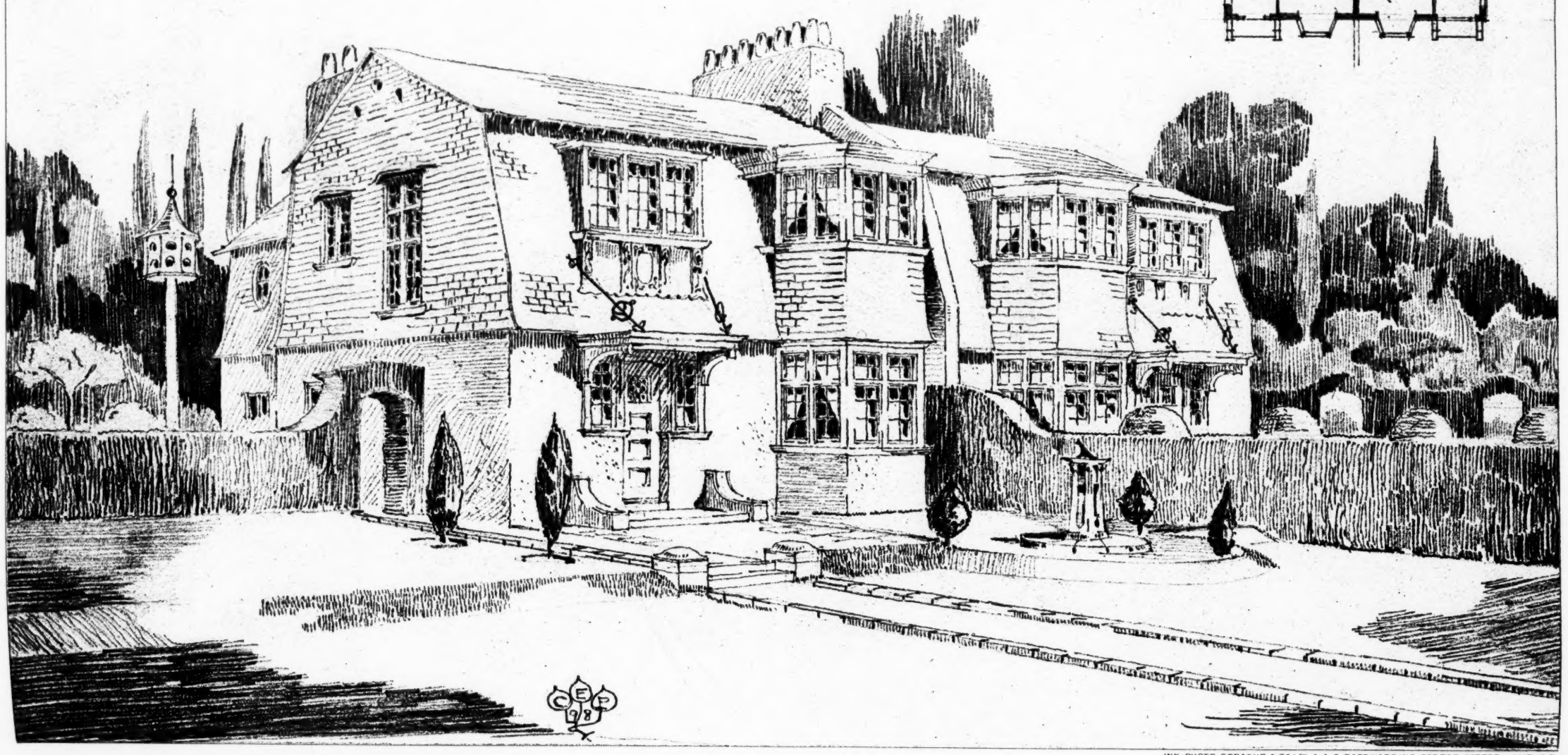
SUBJECT: A CENTRAL ESTABLISHMENT FOR A NATIONAL BANK.

# HOUSES · AT · WALTON-ON-THAMES : CYRIL·E·POWER. ARCHITECT

GROUND FLOOR PLAN.



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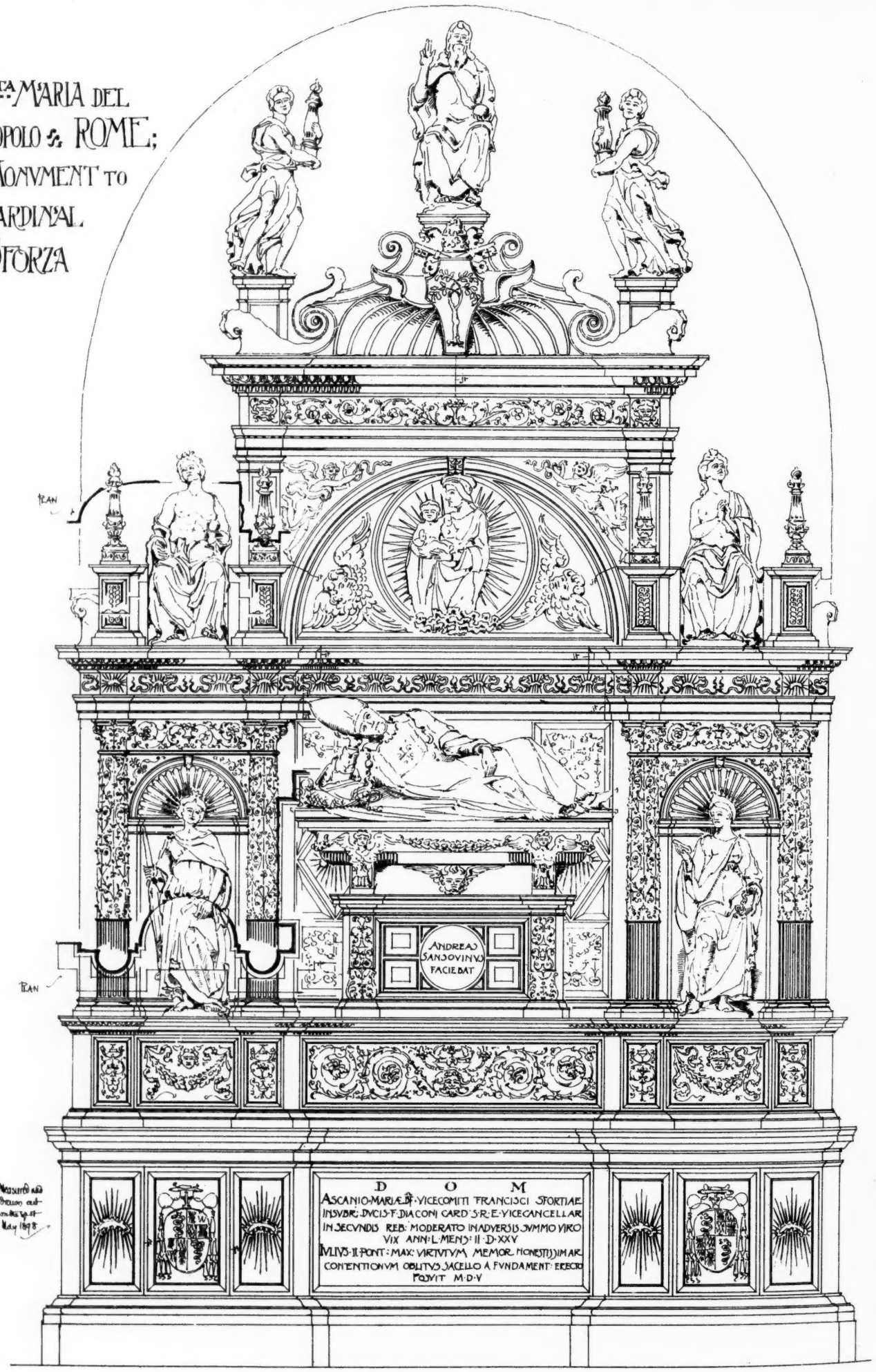
# STA MARIA DEL POPOLO & ROME; MONVMENT TO CARDINAL SFORZA




ELEVATION

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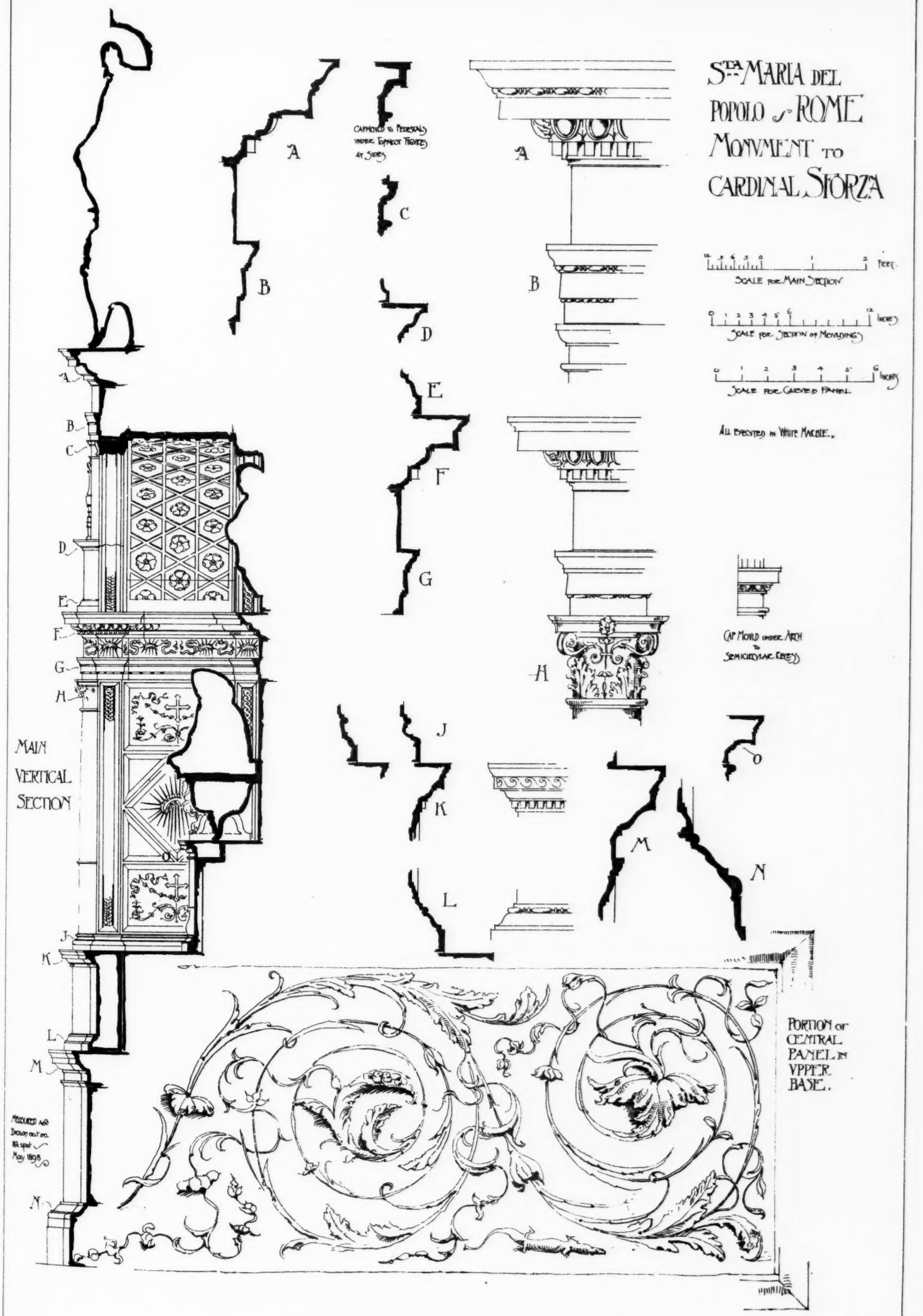
# STA MARIA DEL POPOLO & ROME MONUMENT TO CARDINAL SFORZA

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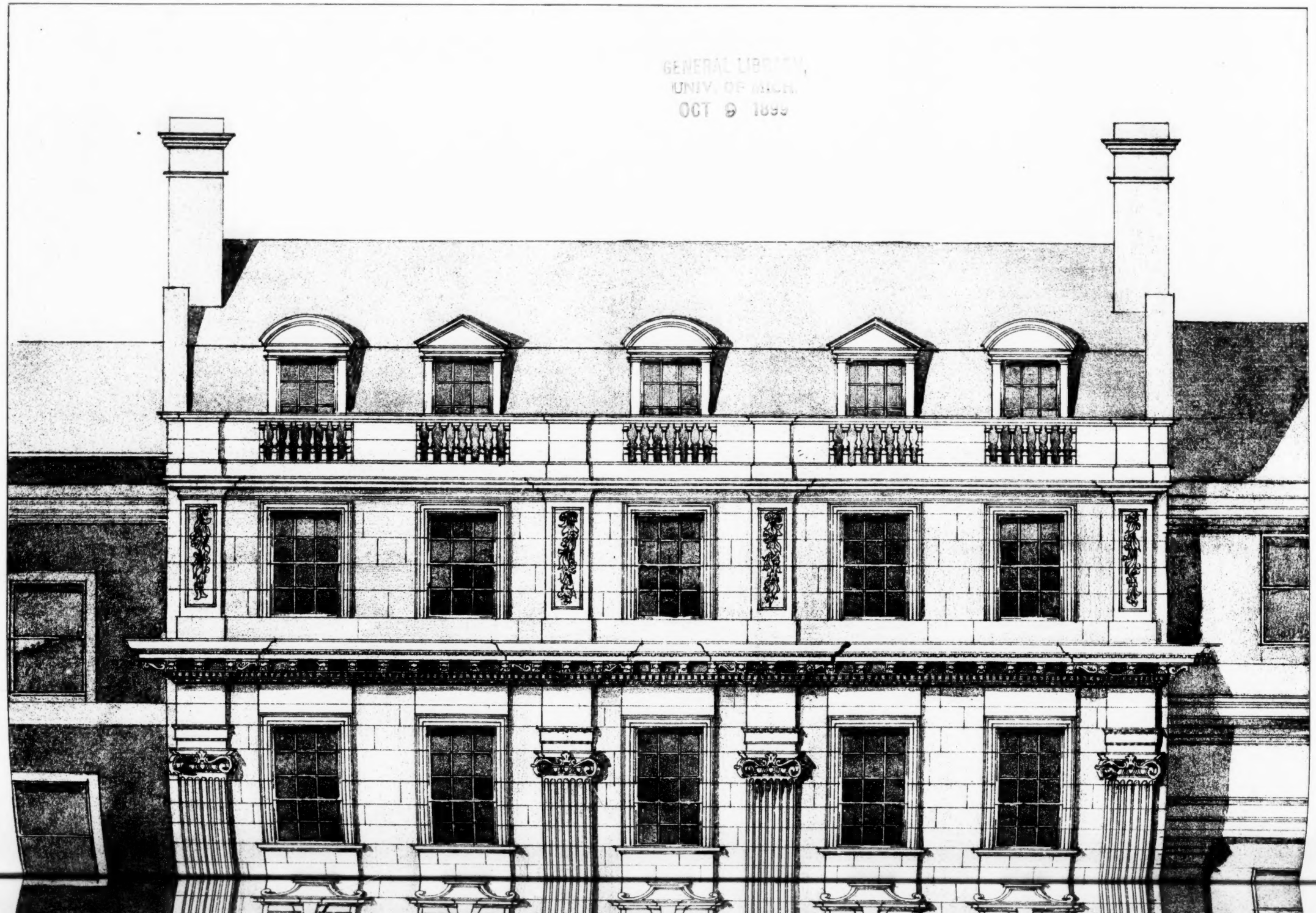
UNIV. OF MICH.
OCT 9 1899

GENERAL LIBRARY,
UNIV. OF MICH.
OCT 9 1899



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